SERVICE CANADIEN DE LA FAUNE
RAPPORT ANNUEL
1989-1990

CANADIAN WILDLIFE SERVICE
ANNUAL REVIEW
1989-1990

Environnement Canada
Service canadien de la faune
Environment Canada
Canadian Wildlife Service

Canada

ANNUAL REVIEW

1989-90

Canadian Wildlife Service

Conservation and Protection

Environment Canada

91-00938/

THE CANADIAN WILDLIFE SERVICE

The Canadian Wildlife Service (CWS) is part of Conservation and Protection, Environment Canada.

The CWS is responsible for the protection and management of migratory birds through development of regulations, habitat management and supporting research and surveys. Together with the provincial and territorial governments the CWS undertakes research and resource management related programs related to wildlife where there is a national interest and advises other federal agencies on wildlife matters. The CWS also participates in international agreements and programs on wildlife conservation.

Administratively, the CWS is organized into a headquarters office located in Hull, Québec and five regional offices:

- Atlantic Region (Sackville, New Brunswick)
- Quebec Region (Sainte-Foy, Québec)
- Ontario Region (Ottawa, Ontario)
- Western and Northern (Edmonton, Alberta)
- Pacific and Yukon (Delta, British Columbia)

Table of Contents

Chapter 1
Migratory Birds and Conservation Branch 1

National Program 1.1 - **Migratory Birds** 1
Waterfowl Populations 1
Nongame Birds Program 1
Latin American Program 1
Lead Shot 2
Wild Animal and Plant Protection Act 2
Legislation, Regulations and Enforcement 2
Protocol to Amend the Migratory Birds Convention 3
Arctic National Wildlife Refuge - "1002" Lands Issue 3
National Program 1.2 - **Wildlife Habitat** 3
National Program 1.3 - **Endangered Species** 4
National Program 1.4 - **International Wildlife** 5
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) 5
National Program 1.5 - **Comprehensive Native Land Claims** 6
National Program 3.3 - **Toxic Substances** 7
Research on Toxic Chemicals 7

Chapter 2
North American Waterfowl Management Plan Implementation Branch 9

Introduction 9
National Program1.2 - **Wildlife Habitat** 9
Partnerships 9
Implementation 10
Financial commitments 10
International 11
Evaluation 11
Communications 11
Conclusion 12

Chapter 3
Wildlife Toxicology and Surveys Branch, National Wildlife Research Centre 15

National Program 1.1 - **Migratory Birds** 15
Research 15
Migratory Birds Surveys 16
National Program 3.2 - **Long-Range Transport of Airborne Pollutants (LRTAP)** 17
National Program 3.3 - **Toxics** 18
Toxicology Research 18
Chemistry Research 19
Contaminants Evaluation 21
Pesticides Evaluation 22
Laboratory Services 25

Chapter 4
Program Analysis and Coordination Branch 29

National Program1.4 - **International Wildlife** 29
National Program 2.1 - **Management and Administration** 29
Research Strategy 29
Council of Wildlife Ministers 29
Environmental Agenda 30
Program Evaluation and Assessment 30
Publications 31
Marketing 31
National Program 2.1 - **2.2 Ecological and Economic Interdependence** 33
Humane Trapping Program 33

Chapter 5
Atlantic Region 35

National Program1.1 - **Migratory Birds** 35
Migratory Birds Convention Strategy 35
Annual Enforcement Plans 35
Newfoundland / Eider Management Plan 35
MBC Act Regulation Amendments 36
The Newfoundland Hunter Opinion Survey 36
Seabird Conservation Workshop 36

Forest Bird / Habitat Study 36
National Program 1.2 - **WILDLIFE HABITAT** 37
The Eastern Habitat Joint Venture Prospectus 37
Candidate Ramsar Sites 37
National Program 1.3 - **Endangered Species** 38
National Program 1.4 - **International Water / Wildlife Resources** 38
National Program 1.5 - **National / Regional Water and Wildlife Resources** 38
National Program 1.6 - **Natural Hazards** 39
National Program 2.1 - **Management and administrative support** 39
National Program 2.2 - **Ecological and Economic Interdependence** 39
National Program 3.1 - **Environmental Impacts of New Initiatives** 40
National Program 3.2 - **Air and Water Emissions / Effluents** 40
National Program 3.3 - **Toxics** 40

Chapter 6
Québec Region 43

National Program 1.1 - **Regional Overview** 44
Regulations and Enforcement 44
Publications 44
Research and Population Surveys 45
Game Birds 45
Seabirds 46
Landbirds 46
National Program 1.2 - **Migratory Birds** 47
St Lawrence Action Plan -- Habitat Conservation 47
Eastern Habitat Joint Venture 47
Habitat Management and Acquisition Assistance Program 47
Communications and Marketing 47
National Program 1.3 - **Wildlife Habitat** 48
Public Awareness Campaigns 48
Research on Ecosystems 49
National Program 3.2 - **2.2 Ecological and Economic Interdependence** 49
Research on Contaminants 49
National Program 3.3 - **Effects of Emissions and Effluents on the Air and Water** 49
Research on Toxic Chemicals 49

Chapter 7
Ontario Region 53

National Program 1.1 - **Migratory Birds** 53
North American Waterfowl Management Plan Implementation 53
Lead Shot 54
Colonial Waterbirds of the Great Lakes 54
Songbirds 54
Regulations and Enforcement 54
National Program 1.1 - 56
National Program 1.2 - **Wildlife Habitat** 56
North American Waterfowl Management Plan Implementation 56
Habitat Conservation - National Wildlife Areas 56
National Program 1.3 - **Endangered Species** 57
Recovery Status 57
National Program 1.5 - **Regional Wildlife** 57
Native Affairs 57
National Wildlife Week 57
National Program 1.6 - **Natural Hazards** 57
Goose Control 57
Gull Control 58
National Program 3.2 - **Air / Water Emissions / Effluents** 58
Acid Rain (LRTAP) / Wildlife Research 58
National Program 3.3 - **Toxics** 59
Great Lakes Water Quality and Pesticides 59
Lead Poisoning 60
National Program 3.4 - **Spill and Waste Sites** 60
Oil Spill Response Strategy 60

Chapter 8
Western And Northern Region 63

National Program 1.1 - **Regional Overview** 63
Monitoring of Panamerican Migrant Birds 63
Arctic Goose Research 64
Arctic Goose Joint Venture Prospectus 64
Rangeland Management 64
Waterfowl Nesting Habitat 64
Climate Change 65

Dabbling Ducks 65
Biometrical Support 65
Waterfowl Population Regulation 65
Waterfowl Populations - NWT 66
Waterfowl Populations - Prairies 66
Passerine and Larid Surveys 67
Latin American Program Studies 67
National Program 1.2 - **Migratory Birds** 67
Shorebirds 67
Areas of importance and management plans 67
Sanctuaries 68
National Program 1.3 - **Wildlife Habitat** 68
Whooping Cranes 68
Loggerhead Shrikes 68
Whooping Crane Ecology and Rehabilitation 68
Woodland Caribou 69
Trumpeter Swans 69
Wood Bison Recovery Program 69
Peary Caribou 70
Piping Plovers 70
Swift Fox 71
Anatum Peregrine Falcon Recovery 71
National Program 1.4 - **Endangered Species** 71
Polar Bear Ecology 71
National Program 1.5 - **International Water and Wildlife Resources** 72
Migratory Bird / Agriculture Interactions 72
Wetland Margin Study 72
Northern Land Claims 72
Beverly-Kaminuriak Caribou Management Board 72
Wolf Ecology 72
National Program 3.3 - **National / Regional Water and Wildlife Resources** 73
Lead Shot Poisoning in Waterfowl 73
Toxic Substances 73

Chapter 9
Pacific and Yukon Region 75

National Program1.1 - **Regional Overview** 75
Regulations and Enforcement Section 75
Waterfowl Management 76
Waterfowl Studies - Northern B.C. 76
Yukon Migratory Bird Studies 76
Brant and Snow Geese 77
Status of the Harlequin Duck and Other Waterfowl Studies in B.C. 77
Great Blue Heron Population Studies 77
High Seas Drift-net Fishery 78
Marbled Murrelets 78
Marine Birds 78
Nestucca Oil Spill Studies 78
Old Growth Forest Birds 79
Birds of British Columbia 79
Communications 79
Electronic Data Processing 80
National Program 1.2 - **Migratory Birds** 80
Habitat Management and Assessment 80
Habitat and Ecological Assessment 80
Snow Goose Winter Ecology 81
Wetlands 81
Land-use Studies 81
SOE Reporting 81
Spans Geographic Information System 81
Provincial Ministries. 82
Environmental Emergencies 82
National Program - **Wildlife Habitat** 82
Yukon Caribou 82
Panama Shorebird Studies 83
National Program 3.3 - **1.4 International Water / Wildlife Resources** 83
Toxic Chemicals 83

Index of Wildlife References 87

Chapter 1

Migratory Birds and Conservation Branch

National Program 1.1
Migratory Birds

Waterfowl Populations

In western Canada, prairie habitat deteriorated further in response to widespread drought. For many species, populations on the breeding areas and their productivity rates continued to decline from the low levels observed last year. There is particular concern for populations of Northern Pintails, Mallards, Blue-winged Teal, scaup and Canvasbacks. In eastern Canada, surveys of breeding populations of Black Ducks generally indicated stable populations with the exception of breeding ducks in Prince Edward Island which continued to decrease. Overall, goose populations continued to increase as they have during recent years.

For the second year, CWS headquarters produced a set of annual migratory game bird status reports and circulated it for input from CWS regions, provincial and territorial wildlife agencies, national non-government organizations, and the U.S. Fish and Wildlife Service. This consultative approach led to more thorough discussion of proposed regulations by all interested parties.

To provide data for this effort, we appended information from regional surveys of breeding waterfowl populations to historical data sets, and analyzed the results for long- and short-term trends. We added historical kill levels by recreational hunters in Canada and recent kill levels for the U.S. to the centralized database and examined population counts from mid-winter in ventories throughout the U.S. for historical trends.

Nongame Birds Program

Working-level committees representing headquarters and the regions are now in place to deal with issues of concern to seabirds, shorebirds, and songbirds. At annual meetings these committees review CWS program activities, identify problems and priorities for future work, and develop management strategies for species of concern. The committee has begun to develop a national database of the status and trends of populations of nongame bird species. It is also developing background material for public information on forest birds and forestry practices and for a national volunteer survey on the status of loons.

The BIRDQUEST program introducing children to birdwatching was distributed to 40 natural history clubs throughout Canada in a pilot project to evaluate its effectiveness.

Latin American Program

Major priorities for the Latin American Program in 1989-90 included implementing the Tripartite Agreement with Mexico, supporting the implementation of the North American Waterfowl Management Plan, supporting the development of the Western Hemispheric Shorebird Reserve Network (WHSRN), and initiating work on long-distance forest bird migrants.

Work in support of the Canada / Mexico / U.S. Tripartite Agreement and North American Waterfowl Management Plan (NAWMP) included technical review of projects proposed by Mexican institutions; continuation of a joint project with the U.S. Fish and Wildlife Service on wintering snow geese in northern Mexico; support for a Mexican biologist to attend the Pacific Flyway Council meeting in Delta, B.C.; assessment of opportunities for cooperative work on water quality near a wetland reserve in southern Mexico; surveys of waterbirds along the Pacific coast of Mexico where development is occurring rapidly; and an assessment of opportunities for work on threatened Burrowing Owls wintering in northern Mexico.

Projects funded in support of WHSRN included an investigation of pesticide use on agricultural lands near a WHSRN reserve in Suriname; continuation of banding and observations of shorebirds in Panama (cut short by the U.S. invasion of that country); observations of endangered Piping Plovers on wintering habitat in Cuba; and funding of a video recording of the WHSRN Council meeting for use in public education.

Initial projects on long-distance forest bird migrants included an assessment of opportunities for study of forest birds work in Costa Rica; continuation of a joint project with Long Point Bird Observatory to train Cuban scientists in bird banding and monitoring; and support for a display developed by a non-government group to educate the Canadian public on the value of tropical forests.

Lead Shot

CWS prepared "A draft policy statement for the use of lead shot for waterfowl hunting in Canada". Lead shot is known to cause lead-poisoning of waterfowl in some intensively hunted areas of Canada, but appears not to affect wildlife in most of the country. The draft policy proposes that the use of lead shot be banned where there is evidence of a lead-poisoning problem. These areas will be called "non-toxic shot zones," and will be regulated by the Migratory Birds Regulations of the Migratory Birds Convention Act. The first of the non-toxic shot zones will be implemented in Ontario and B.C. during the 1990 hunting season. Additional zones will be designated in 1991 and 1992.

Wild Animal and Plant Protection Act

In October, 1989 the Department of Justice printed the proposed Wild Animal and Plant Protection Act in the form of a draft bill. The proposed act was discussed at the meeting of the Canadian Council of Wildlife Ministers held in Québec City, November 14-15, 1989. The Minister of the Environment reminded his provincial colleagues that international trade is a federal constitutional responsibility and that the federal government intends to retain its lead role. On January 31, 1990, the Deputy Minister of Environment advised provincial wildlife deputies that the bill does not infringe upon provincial responsibility for controlling the removal of wildlife from a province. Formal consultations on how the proposed act will be implemented and on the content of regulations began in February 1990 at a workshop hosted by the Manitoba Wildlife Branch. At the end of the fiscal year, the bill still awaited First Reading.

Legislation, Regulations and Enforcement

The Minister of Environment is responsible for implementation of the Migratory Birds Convention Act, the Canada Wildlife Act, and the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES). Until 1988, the compliance and enforcement program had depended heavily on the RCMP. As a consequence of the disbandment of the RCMP Migratory Birds Section, the CWS increasingly coordinates and carries out enforcement operations.

The CWS is now redefining and streamlining its enforcement program. The review covers all aspects of the program: legislation, preventive measures, education, compliance, and enforcement.

Protocol to Amend the Migratory Birds Convention

Canada and the U.S. signed a protocol to amend the subsistence hunting provisions of the Migratory Birds Convention in 1979. However, the U.S. did not ratify it due to opposition from interest groups in Canada and the U.S. A solution acceptable to all parties has been sought since that time.

Wildlife ministers discussed the issue at their meeting in September 1988. They instructed officials to continue exploring innovative approaches to the problem. In February 1989, officials of Environment Canada and Justice Canada met to begin outlining legally feasible approaches to the problem. Early in 1990, viable approaches were to have been put forward for discussion by stakeholders, including other government agencies and aboriginal groups. These consultations will lead to the development of a Canadian position for discussion with the U.S.

Arctic National Wildlife Refuge - "1002" Lands Issue

In April 1987, the U.S. Department of the Interior recommended to the U.S. Congress that lands in the Arctic National Wildlife Refuge designated under Section 1002 of the Alaska National Interest Lands Conservation Act be opened for petroleum exploration and development. These lands are valuable habitat for three important transboundary wildlife populations: the Porcupine caribou herd, polar bears, and migrating Lesser Snow Geese.

Canada asked for consultations about the proposal, a request that resulted in meetings between the two countries in February and March 1987. Canada's position is that the risks of hydrocarbon development far outweigh the benefits, and we urged that the U.S. adopt a wilderness designation of the "1002" lands. The wildlife in question is very important to northern people, who depend on it for subsistence and as part of their cultural heritage.

Public reaction to the massive oil spill from the Exxon Valdez in Alaskan waters in 1989 cooled the U.S. pressures for petroleum from the "1002" lands, at least temporarily. Canada continued to monitor developments in the U.S. Congress throughout 1989-90. CWS is in a good position to offer sound, scientifically-based advice on the Porcupine caribou herd, polar bears, and Lesser Snow Geese.

National Program 1.2
Wildlife Habitat

CWS headquarters has developed a draft strategy for maintaining or enhancing Canada's wildlife habitat in order to sustain species indigenous to Canada. The document Wildlife Habitat Strategy is being reviewed within CWS and will be finalized in 1990-91.

A draft of the National Wildlife Area Systems Plan was completed and distributed for CWS review in June 1989. It will be revised and finalized in 1990-91.

CWS has continued to work towards the establishment of two migratory bird sanctuaries at Isle aux Canes (Green Island) and Shepherd Island in the Strait of Belle Isle Newfoundland, and one on Prince Leopold Island, N.W.T. The sanctuaries should be fully gazetted in 1990-91. Revised Regulatory Impact Analyses Statements were developed for the migratory bird sanctuary (plovers) in Prince Edward Island National Park, and the one in Portobello, N.B. Sanctuaries will be gazetted in 1990-91. In Saskatchewan, the national wildlife areas (NWAs) of Raven Island, Stalwart, and Tway were enlarged. Three of B.C.'s NWAs, Brisco, Herrogate and Spillmacheen, have been united with a fourth, Wilmer, to create the Columbian NWA. The area advisory committee received comments on the draft management plan for the Polar Bear Pass NWA, N.W.T. and revised the management plan. It is anticipated the Polar Bear Pass area will be gazetted in 1990-91. Lands have been

transferred from the Saskatchewan provincial Crown lands to the federal government to create Last Mountain Lake NWA. The gazetting process for this area will begin in 1990-91.

A Ramsar site management plan draft was completed for Walpole Island, Ontario. Review and application will take place during 1990-91.

Baseline studies have been conducted in the parkland areas of Alberta and Manitoba as part of the Prairie Habitat Monitoring Project (PHMP). This project contributes to the evaluation plan of the North American Waterfowl Management Plan. Planning for the resurvey of study areas in the PHMP will begin in 1990.

CWS and Sustainable Development Branch of Environment Canada and Wildlife Habitat Canada continued to cooperate on the "Wetland are Not Wastelands" project. Pilot projects have evaluated methods for calculating social values (including monetary) for four types of wetlands across Canada: the Minudie area, N.S.; the Greenock Swamp, Ont.; Cowichan Estuary B.C., and the pothole region of the Prairies. A January 1990 meeting of international economic experts was convened to review the application of evaluation techniques used in these pilots. In 1990-91 they will recommend methods and a procedure that planners and decision makes in Canada can use to assess wetland values.

A soil and water conservation project, a cooperative venture of CWS, Sustainable Development Branch, Agriculture Canada and Wildlife Habitat Canada was developed and implemented by a consultant under contract. The consultant reviewed agricultural subsidy policies --primarily those applied to farms in western Canada looking at how they could be improved to mesh with soil and water (habitat) initiatives.

The Alberta Agriculture/Forest Interface study, a cooperative project between CWS Headquarters and CWS Western and Northern Region and the Alberta government to examine land-use change and its impact on wildlife habitat, agricultural land, and forests was completed.

CWS initiated a project to identify the wildlife habitat capability of federally owned land with examination of sites in British Columbia. The project will continue in 1990-91.

National Program 1.3
Endangered Species

Recovery of Nationally Endangered Wildlife (RENEW) is a strategy to deal with the recovery of endangered and threatened mammals, birds, reptiles and amphibians. The strategy calls for recovery teams and recovery plans for each eligible species by 1991. A new organization, also called RENEW, consists of the heads of all wildlife agencies in Canada and the three major national wildlife organizations. The goal of RENEW is to enable its members to work as a team to preserve threatened and endangered species from extinction and to prevent vulnerable species from becoming threatened or endangered. The CWS is providing a permanent secretary to the RENEW Committee and has already provided the committee with draft bylaws, a method of ranking species for management attention, and a format for recovery plans. At the wildlife ministers' conference in fall 1989, the Minister of the Environment and his colleagues received the organization's first annual report. RENEW will hold its second annual meeting in June 1990.

In September 1988 the funding available for endangered species in Canada got a 25% boost when the Minister of the Environment signed an agreement with World Wildlife Fund Canada to create an Endangered Species Recovery Fund. Operating over the next four years, the fund will provide $2 million to nongovernment organizations for projects to recover threatened and endangered species. The Department of the Environment is providing $1 million. Each successful applicant to the fund must provide $1 for every $2 received from the fund, thus stimulating the raising of funds for endangered species work from the private sector. The fund is administered by World Wildlife Fund Canada; two CWS employees serve on a scientific advisory group that makes recommendations to the World Wildlife Fund about allocation of funds. During its first year of

operation, the fund committed about $1 million to over 40 projects, some of it to be spent in 1990 and 1991. Projects on mammals, birds, reptiles, amphibians, plants and marine species were funded.

National Program 1.4
International Wildlife

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

The main event of 1989 was the Seventh Meeting of the Conference of the Parties to CITES held in Lausanne, Switzerland, October 9-20. Canada sent a strong delegation that included the CWS Director General and three other officers plus representatives from Fisheries and Oceans, External Affairs, the National Herbarium, the Governments of Ontario and Québec and the University of Toronto. The delegation was headed by P. Boyer, M.P., Parliamentary Secretary to the Secretary of State for External Affairs.

The meeting was highlighted by very lengthy, strongly debated and often heated discussion on the status of the African elephant in Africa. In addition to the Committee and Plenary debates, lobbying by involved governments and non-governmental organizations was intense and continual, which was often detrimental to discussions on other species and general business of the Meeting. Eventually, the African elephant was upgraded to Appendix I from Appendix II. As a result, seven nations -- Zimbabwe, Zambia, Malawi, Botswana, South Africa, China and the United Kingdom (on behalf of Hong Kong for a six-month period expiring in July 1990)--have placed reservations against the listing, thus removing themselves from Convention requirements for the species.

Although a proposal was not formally tabled, lengthy discussions took place between members of the Canadian delegation and the delegation of Japan concerning the black bear. The Japanese have noted an increase in the volume of bear gall bladders, either dried or in a paste, being imported into Japan from North America. As the black bear is the only bear not regulated by CITES, the Government of Japan has asked Canada and the U.S. to place the species on our respective Appendix IIIs as an interim measure before the species is proposed for Appendix II. Japan hopes that Canada and the U.S. will propose an Appendix II listing at the next Conference of the Parties.

Canada tabled a Resolution on the Format and Criteria for Proposals to Register the First Commercial Captive-breeding Operation of an Appendix I Animal Species that, after minor amendment, was adopted by the Parties. This resolution establishes criteria that must be met for registration of captive-breeding Appendix I animal species. An identical proposal was also tabled by the U.S. Canada also tabled a proposed Resolution on the Shipment of Live Animals that was also adopted by the Parties.

Canada replaced the U.S. as the regional representative on the Standing Committee for the period between the Seventh and Ninth Conferences of the Parties, and was elected as vice-chair of the committee for the period between the Seventh and Eighth Conferences.

Canada, as the North America Regional representative for the Animals Committee, was elected to chair the committee for the period between the Seventh and Eighth Conferences. This position will once again be filled by M. Shoesmith of the Government of Manitoba.

The Standing Committee of CITES, of which Canada was the previous Host Member for 1987-89, met in Lausanne, February 27 to March 2, 1989. The Canadian delegation consisted of two officers of the CWS. The main topic of discussion included planning for the October Conference of the Parties and the report of the working group (Canada, Indonesia, and the United Kingdom) that was established in 1988 to review the operations of the CITES Secretariat.

The Administrator, CITES, attended IATA Live Animals Board Meetings in Montreal, February 13-15, San Antonio, Texas, U.S., April 3-7, and Geneva, Switzerland October 23-27, and the annual meeting of the Animal Air Transport Association in San Antonio, April 9-12, in his capacity as Chair, CITES Transport Working Group.

J. Heppes, Administrator, CITES, and P. Boyer, M.P., attended an African Elephant working group meeting in Botswana, July 3-7, 1989 concerning the status of the elephant in Africa. Throughout Africa, elephant populations have apparently declined over the last 10 years from about 1.3 million to approximately 700 000 animals. The rate of decline is rapid and African States and other concerned countries were meeting to try to find ways of stopping the decline of elephant populations resulting from excessive illegal take and trade.

A North America Regional CITES Meeting between Canada, the U.S. and Mexico was hosted in Arlington, Virginia, by the U.S., April 25, 1989. The meeting addressed the proposals that were expected to be tabled for the Conference of the Parties in order to agree on a common regional position on the proposals.

The Animals Committee, chaired by M. Shoesmith of the Government

of Manitoba, met in Montevideo, Uruguay, April 4-7, 1989, to review proposals to amend the CITES Appendices that were expected to be tabled for the October Meeting of the Parties.

One-day public consultation days were held in March and September during which CWS-CITES presented the positions that Canada proposed to take at the October Conference of the Parties in response to proposals to amend the Appendices and other proposed Canadian and foreign resolutions. Both meetings, attended by a few representatives of non-governmental organizations, provided valuable input to the Canadian position and gave government officials an opportunity to explain their official approach to the subject matter.

Although the number of permits and certificates issued by CITES Headquarters, other federal departments, the provinces, and the territories was about the same as in 1988, the Headquarters workload in dealing with telephone calls, written communications and the detailed review of applications for permits increased considerably.

During 1989, the federal government issued 74 (74) import permits, 2266 (2231) export permits, 79 (88) transit certificates and 38 (41) scientific certificates. During the same period, CITES Authorities of provincial and territorial governments issued 3354 (3477) export permits (1988 figures are shown in brackets).

National Program 1.5
Comprehensive Native Land Claims

CWS continued to play an active role in native land claims. The most significant achievement in this area in 1989-90 was the initialing of the agreement in principle of the Tungavik Federation of Nunavut land claim by the chief negotiators in December 1989. It culminated a decade of negotiations. CWS contributed significantly to the "Wildlife harvesting and management" chapters of the agreement.

Negotiations leading to a final Agreement of the Dené-Métis comprehensive land claim continued throughout 1989-90. In addition land selections began in one of the five regions of the Dené-Métis settlement area. CWS has identified nine sites in the settlement area that are important migratory bird habitat, and special attention will be paid to these during land selections. It may be necessary to protect some of these sites under the "protected areas" provisions of the Final Agreement.

In 1988-89, CWS participated in negotiations on an "umbrella" agreement for the comprehensive land claim of the Council of Yukon Indians. Negotiations have begun on the Labrador Inuit claim and the Conseil Attikamek - Montagnais claim of Québec. CWS continues to be involved in the implementation of the Inuvialuit Final Agreement and the James Bay and Northern Québec Agreement.

National Program 3.3
Toxic Substances

Research on Toxic Chemicals

In order to establish a series of bioindicators of the contamination of ecosystems by toxic chemicals, we continued to evaluate certain species of birds, reptiles and other amphibians in conjunction with the St Lawrence Centre. A history of the use of various species as bioindicators for the study of the Great Lakes-St Lawrence system was written at the same time. These two projects were presented at the symposium on the St Lawrence held as part of the Québec Biologists' Association conference.

We also conducted three new experiments to assess the impact of pesticides on the environment. The studies bore on lawn treatment in cities, potato farming and Christmas tree production.

Finally, a pilot study was conducted with Hydro-Québec to determine the ecological tendencies and consequences of the increase in methyl mercury after large hydro-electric reservoirs were brought on stream in northwestern Québec. The Osprey turned out to be a good species to use as a bioindicator for this type of study.

Chapter 2

North American Waterfowl Management Plan Implementation Branch

Introduction

Last year, a new branch -- the NAWMP Implementation Branch -- was created to facilitate implementation of the North American Waterfowl Management Plan. NAWMP activities in Canada are carried out in close collaboration with other branches at CWS Headquarters, the Regional Offices, and U.S. Fish and Wildlife Service.

National Program1.2
Wildlife Habitat

The North American Waterfowl Management Plan (NAWMP) was signed in May 1986 by the Minister of the Environment and the United States Secretary of the Interior. Mexico has since agreed to participate.

The Plan addresses the loss of wetland habitats and establishes specific objectives to restore waterfowl populations and habitat. Waterfowl are indicators of the environmental health of the continent's wetlands.

The Plan is based on the central theme that conservation of waterfowl and its habitat require long-term planning and coordination of management activities across borders, cooperation and financial contributions from users of the resource, and scientific research in support of conservation measures. By restoring and enhancing wetlands, especially on private land, the Plan helps all wildlife species that depend on wetlands, as well as human communities. NAWMP complements other environmental policies and programs, for example, soil and water conservation programs.

Partnerships

Implementation of NAWMP is being carried out through joint ventures, i.e. partnerships with landowners, nongovernment organizations, private sector, and governments. Provincial and territorial governments as well as two federal departments (Environment Canada and Agriculture Canada) and major NGOs, such as Wildlife Habitat Canada and Ducks Unlimited, are involved in implementation.

Particularly in western Canada, the support of the agricultural community is required to achieve NAWMP objectives. Cooperation and liaison with Agriculture Canada has continued during the year. Specific programs of interest to both the agricultural sector and NAWMP are the Soil Conservation Program (Permanent Cover Program), the Crop Insurance Program (Waterfowl Damage Compensation and Prevention), and "Prairie Care".

Other federal partners include the Department of External Affairs, which has been closely involved with NAWMP transboundary activities, and Indian and Northern Affairs, focusing on native land users.

Four initial joint ventures fall primarily within Canada. The Eastern Habitat Joint Venture (EHJV) and the Prairie Habitat Joint Venture focus on habitat protection. The Black Duck Joint Venture in eastern Canada and the Arctic Goose Joint Venture in the far north, are primarily research and popula.ion joint ventures. A fifth joint venture, the Pacific Coast Joint Venture, is proposed for the west coast of Canada and the U.S.

In 1989, two major joint ventures were officially launched in Canada, by the signing of the Prairie Habitat Joint Venture and the Eastern Habitat Joint Venture. The federal Minister of the Environment and the provincial wildlife ministers signed agreements to establish for the two joint ventures advisory boards. Senior representatives of Ducks Unlimited Canada and Wildlife Habitat Canada registered their unanimity by signing as well.

The important international partnership between Canada and the was emphasized at the signing ceremony for the EHJV, by the presence of representatives from the Office of the Secretary of Interior, the North American Waterfowl Management Plan Office, Ducks Unlimited Inc., and the National Fish and Wildlife Foundation.

In addition, NAWMP has explored linkages to the business sector in Canada, in order to encourage extended private sector support to the Plan.

Implementation

The Plan is already being implemented, with eight "First Step" projects underway in eight provinces. Additional projects will be established in 1990 under "Second Step". Project activities range from the securement of wetland areas, to specific habitat improvement measures, to cooperative land practice agreements with landowners.

The Eastern Habitat Joint Venture was active in five "First Step" projects and developed, in 1989, a prospectus and a 5-year plan. Under the "Second Step" program, (i.e. activities to be started in 1990), 15 new projects are being established.

In the west, under the Prairie Habitat Joint Venture, three "First Step" projects were established. New "Second Step" activities will include the Prairie Care program and Manitoba, Saskatchewan, and Alberta implementation plans, which include some 15 new and continuing projects.

Under the Black Duck Joint Venture, a final strategic plan covering a five-year period starting in 1990 is being prepared. The inaugural meeting of the Arctic Goose Joint Venture was held in September, 1989. A final prospectus is being developed and will be approved in 1990.

A fifth joint venture, the Pacific Coast Joint Venture, is being established in 1989-90. This will also become the first truly international joint venture under NAWMP because it would cover British Columbia, the Yukon, Alaska, and the Pacific coast of the U.S. A Canadian coordinator has been appointed to develop, in cooperation with the U.S., a prospectus for the PCJV.

Financial commitments

In 1989, the Canadian federal government committed $30 million over five years (1989-90 to 1993-94) to implement NAWMP. The $30 million are taken from the federal priority reserves and are new moneys directed to fulfilling the federal commitment to the goals and objectives of the Plan. These federal funds together with $75 million from other Canadian partners and another $300 million from the U.S. will result in over $400 million being expended on habitat protection and enhancement over the next five years. This long-term commitment represents a giant advancement towards the full challenge called for in the Plan.

Most provinces have already invested in NAWMP projects, as have Ducks Unlimited and Wildlife Habitat Canada. Saskatchewan and Alberta have announced long-term funding commitments of $49 M and $36 M respectively over 15 years and Ducks Unlimited has committed itself to contribute $50 M to NAMWP over the life of the program. In addition, local nongovernment organizations have committed time and labour as well as funds.

International

In December 1989, U.S. President Bush signed new U.S. legislation to conserve North American wetlands, migratory birds, and wildlife. "The North American Wetlands Conservation Act" is intended to protect North American waterfowl and other wildlife that depend on wetland ecosystems. One of the principal goals of the legislation is a long-term commitment to work with Canada and Mexico in implementing NAWMP. The act will also provide U.S. federal funding to encourage public and private partnerships for wetlands conservation projects in North America.

Evaluation

Evaluation is integral to implementation. Evaluation programs will allow NAMWP managers at all levels to monitor progress toward the goals of the Plan as well as at the Joint Venture level. The information collected will also allow program priorities to be constantly adjusted in order to achieve the goals in a cost efficient and timely manner.

The PHJV has created a multi-agency Evaluation Coordinating Committee and is in the process of staffing the evaluation coordinator position. The committee has drafted workplans and is reviewing proposals for directed studies. The EHJV has directed an ad hoc committee to draft a framework for research and evaluation within the joint venture. This framework will take into consideration similar work done in by the Atlantic Regional Technical Committee and the PHJV.

A Continental Evaluation Team was formed and met for the first in November, 1989. It will be responsible for international coordination of evaluation programs. It will be focusing mostly on technical evaluation and has prepared a set of evaluation guidelines for distribution to Evaluation Coordinating Committees.

A tracking system was developed in cooperation with the U.S. and will monitor progress towards the goals of the Plan. It may be expanded to collect data as required under "Evaluation". Informatic application for this system is being looked at.

Communications

The goal of the communications program is to foster a broad understanding of the problem of continental wetland loss and its effect on waterfowl and other species, develop a public conservation ethic, and enlist participation under the Plan. The communications effort will motivate target audiences and groups to participate in the Plan by supporting cooperator organizations and, if they are landowners, to adopt new land management practices that benefit wetlands and waterfowl.

Communications Plans are in various stages of development. At the international level, a communications framework was presented to the International NAWMP Committee, and a Recognitions Program has been prepared as well. Other joint U.S.-Canada activities include publication of the newsletter "Waterfowl 2000"; production of information materials; development of an education program; and arrangement of information seminars and field trips. A network of communications coordinators and an International Communications Committee have been established jointly between the U.S. and Canadian partners.

A Canadian National Communications Strategy outlines broad objectives and messages to be carried out to both internal and external audiences - all in close cooperation with joint ventures, partners, and the U.S. Fish and Wildlife Service. During the last year, the main efforts for national communications activities were targeted at internal, government audiences in order to solicit and confirm government support for the Plan. Other activities include seminars, field trips for administrators, staff, and partners, and production of information material. A traveling exhibit was jointly produced by Agriculture Canada and CWS.

At joint venture and project level, communication Plans have been prepared and implemented. Various activities are being carried out to inform project participants and publics on NAWMP progress. For example, there are newsletters, targeted mailings, information seminars, ceremonial signings of agreements, media information events, and "open houses" to keep local landowners and interested publics up-to-date on NAWMP activities.

Conclusion

NAWMP is an innovative program working through partnerships of government agencies as well as nongovernment organizations, the private sector, and individuals. The Plan is off the ground and running in joint ventures across the and Canada. With its projects complementing the federal-provincial Soil and Water Conservation initiative, other agricultural and wildlife programs, and adapting to local project needs, NAWMP provides an exemplary demonstration of "sustainable development" in action by promoting an integrated planning approach to land use and environmental management. Conserving wetlands and wildlife helps maintain and protect the diversity of the landscape, the quality of soils and waters, and ultimately the quality of life.

Chapter 3

Wildlife Toxicology and Surveys Branch, National Wildlife Research Centre

National Program 1.1
Migratory Birds

Research

Fieldwork on shorebirds and their habitats was continued on Rowley Island, Foxe Basin, with a fourth year of census and banding studies. In collaboration with T. Piersma of the University of Groningen, the Netherlands, CWS conducted experiments on the energy budgets of free-living shorebirds, using doubly labeled water techniques. This work will help our understanding of the effect of climate and climatic change on breeding distributions of shorebirds in the arctic, development of remote sensing technology to determine the distribution of avian breeding grounds and wildlife habitat was significantly extended through ground truthing studies on Prince Charles Island. Associated avian census data gathered by a team led by M. Moser, Director of the International Waterfowl and Wetlands Research Bureau, and geomorphological studies carried out in collaboration with Professor I.P. Martini of the University of Guelph.

Field studies of the migration and physiology of shorebirds were continued at Alert, Ellesmere Island, to determine the role of body reserves in early season survival and subsequent breeding. This work will help us understand the role of stopover areas in the birds' annual cycles. This will be useful for conservation purposes.

CWS organized the Maritimes / International Shorebird Survey for a 16th year.

Papers on shorebird migration in both New World and European flyways and on the effects of climate change on shorebirds in the Canadian arctic were given at two international meetings in Denmark in September 1989.

The recently published *Atlas of Nearctic Shorebirds on the Coast of South America* was widely circulated, and will stimulate the conservation of coastal habitats used by Canadian-breeding shorebirds in South America. The conservation initiative resulting from this work, the Western Hemisphere Shorebird Reserve Network, developed rapidly during the year.

1989 saw the last year of the Reef Island project on the population dynamics of the Ancient Murrelet. A large number of birds banded in previous years were caught again, which led to an improvement in estimates of adult survival. Twelve birds banded as chicks were retrapped as nonbreeding prospectors, three of them on a nearby colony, demonstrating that not all Reef Island chicks return to the natal colony. An analysis of information obtained since 1984 will be completed shortly. A local conservation group, the Laskeek Bay Marine Ecology Group will continue some aspects of this work, including banding of chicks and monitoring of numbers of seabirds in Hecate Strait.

Fieldwork at Coats Island in 1989 involved identifying as many banded Thick-billed Murres as possible, to provide information on survival to breeding age in this species, which is heavily hunted in Newfoundland in winter. Studies on diving behaviour and physiology of the Murres continued, and complete records of diving times were obtained for four birds equipped with electronic depth-gauges. We discovered that the Murres feed very actively at night, when they dive less deeply that during the day. This behaviour probably tracks vertical diurnal movements of their prey.

CWS continued research on the landscape ecology of forest birds in agricultural landscapes in Ontario , and researchers presented their results at an international symposium on the ecology and conservation of neotropical land birds and at a workshop on ecological approaches to forestry. A study was initiated to characterize landscape structure using remote-sensing techniques (e.g., air photo interpretation, Landsat TM imagery) and the spatial analysis software, SPANS. Bird surveys in a forest surveyed nine years earlier were repeated as part of a collaborative study with Ontario Hydro on the impacts of powerline corridors on forest birds.

Migratory Birds Surveys

The biometrics section began rewriting many of the data selection and analysis programs as the first step in transferring the data files for the National Harvest Surveys, the Breeding Bird Survey and the Canadian Bird Banding Office from mainframe computer to powerful micro-computers. This long process will ultimately result in cost savings, as well as faster turn-around time and more flexibility in producing annual kill estimates and responding to individual requests for data.

There were about 316 000 migratory hunting permits sold across Canada in 1989/90, compared with 323 000 the previous season. The national trend of decreasing sales that began in 1981 continues, with Newfoundland and Alberta being the only provinces to show slight increases. There were about 39 000 hunters selected from the files to receive the National Harvest Survey, which monitors levels of hunting activity and overall number of ducks and geese harvested. An additional 24 000 hunters were chosen for the Species Composition Survey which asks them to send in waterfowl wings or tails to calculate estimates of the proportions of each species in the kill. Biologists and technicians identified these waterfowl parts at the annual wing bee held in Sackville.

The Canadian Bird Banding Office issued 503 master permits and subpermits (new and renewed) to Canadian banders 1989. Together with the US Bird Banding Lab. The office is reviewing the policy on banding of nongame birds in North America, with input from Canadian banders. The goal is to make the present system of songbirds banding more efficient, with improved data handling systems and banding techniques, and increased opportunities for providing training and direction to banders. Banding will be a useful tool to address priorities identified by the new CWS songbird conservation committee.

Plans to maintain and improve the contributions of highly skilled observers to the Breeding Bird Survey (BBS) were initiated with the help of CWS Atlantic Region. The progress notes reporting annual survey results and long-term trends have been revived, and a new newsletter BBS CANADA, began this fall, to provide feedback to participants. CWS staff began annual visits to the provincial BBS coordinators, and these efforts have already resulted in higher participation and support. BBS data has recently proven valuable in state of the environment reporting, and assessments of population status by COSEWIC (the Committee on the Status of Endangered Wildlife in Canada).

National Program 3.2
Long-Range Transport of Airborne Pollutants (LRTAP)

Research continued on the impacts of long-range air pollution on wildlife. The research is designed to provide an understanding of the mechanisms and magnitude of the effects of acidity on wildlife. The program is coordinated at the National Wildlife Research Centre (NWRC), with toxicological research at NWRC' and ecological research in Ontario and Atlantic regions.

In 1989/90, the Canadian LRTAP program prepared a joint federal-provincial LRTAP assessment document, to be published in spring 1990. CWS contributed to the writing of three chapters, dealing with aquatic and terrestrial effects of acid rain on wildlife and socioeconomic ramifications and provided scientific advice on the impacts of acid precipitation on wildlife to the public and to intergovernmental committees.

Experiments were conducted in the NWRC aviary facilities to examine the influence of essential mineral depletion and dietary metal intake, characteristic of acid-stressed environments, on physiology and reproduction of Ring Doves. Reduced calcium in the diet resulted in greater accumulation of dietary metals and physiological indications of toxic effects of these metals, but no obvious reproductive impairment. We looked for accumulation of mercury and selenium in various avian tissues in response to elevated dietary methyl-mercury, a concern for wildlife eating fish from acidified environments.

We analyzed metal and mineral concentrations in duckling and their foods. CWS Ontario Region collected the specimens from lakes varying in acidity. Calcium content of aquatic beetles was depressed at low pH, associated with an increase in lake aluminum concentration. Metal levels in liver and kidney tissues of juvenile waterfowl were assessed from a toxicological viewpoint, and indicated that fish-eaters such as the Common Merganser may be at risk from elevated mercury in fish from acidifying lakes.

A major review of metals and acidification has been submitted for publication as a special issue of the journal, Environmental Pollution. It will include seven papers on topics ranging from metal biogeochemistry to effects on birds and mammals.

Efforts to model the response of waterfowl and loons to lake acidification continued, using data collected from more than 600 wetlands and lakes by CWS Ontario and CWS Atlantic Regions. Acidity of lakes and their size were important factors in determining the presence or absence of fish communities, which in turn influenced the type of waterfowl present on lakes. Analyses are currently under way to validate model relationships and to examine applicability of relationships developed in Ontario to different regions of eastern Canada.

The CWS LRTAP biomonitoring program completed its second year with data collection by regional staff in Ontario and Nova Scotia. Meetings were held among the CWS LRTAP technical staff and with the Department of Fisheries and Oceans to assess the methods and results to date and to consider ways of improving the program, with particular regard for quality assurance and control. A report summarizing the CWS program to date has been drafted, for distribution in 1990.

National Program 3.3

Toxics

Toxicology Research

A special issue of the Canadian Field-Naturalist on the status of the Peregrine Falcon in Canada has been prepared for publication. It consists of 12 papers, eight written in whole or in part by members of CWS including four by members of NWRC.

The Environment Canada contributions to the two technical reports on chemical pollution in the Great Lakes have been completed. Completion of the synopsis report is still awaiting the contribution from Health and Welfare Canada. Release of the reports by the three departments Environment Canada, Fisheries and Oceans and Health and Welfare Canada is expected in mid-summer, 1990.

The first draft of the final paper on the current work on DNA has been written. A start has been made on a monograph, "Biomarkers in environmental health assessment." This work is being carried out at the Monitoring and Assessment Research Centre, King's College, London, Ontario.

Research to develop a chicken embryo liver cell culture technique which will determine the toxicity (as measured by porphyinogenicity and mixed-function exidase induction) of PCBs, dioxin, and related chemicals in extracts from wildlife tissue continued. The major developmental work is almost complete. The technique was shown to have sufficient sensitivity to detect PCB-induced porphyria in extracts from 5-g amounts of egg homogenate from Great Lakes Herring Gulls, and to be at least a thousand-fold more sensitive to the more toxic PCBs (the coplanar congeners) than to relatively non toxic congeners.

Organophosphate pesticiedes exposure

Research to develop a new technique that could unambiguously detect wild bird exposure to organophosphate pesticides by measuring cholinesterase active site serine-phosphate ester continued. Results to date suggest that the approach has considerable promise. Fluorescent derivatives of selected derivatives of serine were synthesized and their structures were confirmed by NMR.

Brain and blood cholinesterase activities were determined in 530 samples of wild birds that were either killed or found dead in the field and organophosphate or carbamate exposure was suspected of being the cause of death.

Lead poisoning

Continuing contributions were made towards gaining a better understanding of the nature and extent of lead poisoning in Canadian waterfowl. Toxicological advice was provided for the drafting of a CWS policy document on the use of lead-shot for waterfowl hunting, and for establishing criteria for identifying non toxic shot zones. A national survey of lead in wing-bones was also initiated. Processing of approximately 12000 wings from juvenile ducks shot across Canada was begun in 1989-90. This survey will estimate the incidence of high lead exposure in ducks hatched on Canadian wetlands, and provide a national perspective on the incidence of shot ingestion by waterfowl in Canada.

Chemistry Research

Chlorinated dioxin furan analysis

A total of 121 chlorinated dioxin furan (PCDDCDF) analyses were performed for 12 different projects across Canada. Eight analytical reports of these results were written and the remaining five are in preparation. Several of the studies were range-finding surveys to determine if fish-eating birds in areas other than the coast of British Columbia and the Great Lakes were contaminated.

Urban and industrial sources of toxin

Double-crested Cormorant, Herring Gull, Common Tern and Red-breasted Merganser eggs were collected from eight areas in New Brunswick, Nova Scotia, and Prince Edward Island which were close to pulp mills or other possible urban and industrial sources of dioxins. TCDD was detected in all samples except at Pinnacle Island, N.B. Levels were generally at "background" of 2-20ng/kg. Traces of other dioxins and 23478-PnCDF were also present. The only sample significantly above background was red-breasted merganser eggs from Bathurst Harbour, N.B. This sample contained a TCDD/TCDF pattern characteristic of a bleached kraft pulp mill, even though the mill near Bathurst is not bleached kraft. Common tern eggs from Bathurst were not contaminated. The source of the contamination in the mergansers is therefore not easily explained.

Herring Gull and Ring-billed Gull eggs and liver and Common Merganser eggs from near the bleached kraft mill at La Tuque on the St. Maurice River in Québec presented a mixed picture. The merganser eggs contained significantly elevated levels (111 ng/kg) of 2378-TCDF, but relatively low levels of 2378-TCDD (7ng/kg), and several other PCDD and PCDF congeners were present. This pattern is more typical of a PCB source than a kraft mill. The herring gull egg sample had slightly elevated TCDD (48 ng/kg), and the other samples had detectable levels of PCDDs and PCDFs, but not especially high.

Saint Basile-le-Grand

Leopard frog, earth worm, masked shrew, mouse, and muskrat samples downwind from the Saint Basile-le-Grand PCB fire were analyzed. None of the samples contained TCDD. The muskrat contained no PCDDs and PCDFs at all, and the worm and frog samples contained low levels of PCDFs which may have originated from a commercial PCB mixture, but were not typical for combustion of PCBs. The shrew and mouse samples contained relatively high levels (110-133ng/kg) of OCDD and other PCDDs typical of a combustion pattern. This may have arisen from the fire, but might equally well be the result of general urban contamination from sources such as exhaust from cars using leaded gasoline. There is no baseline information on which to make a conclusion.

Great Lakes

Levels of 2378-TCDD in Great Lakes Herring Gull eggs appear to have reached an equilibrium level of 10-20 ng/kg except in Lake Ontario, the St. Lawrence River, and Saginaw Bay, Lake Michigan. In these areas levels remain higher (40-90 ng/kg). Levels increased significantly in the Snake Island, Lake Ontario colony from 1988, but this is likely an oscillation in the long-term trend rather than an indication of increasing levels in the lake. The Herring Gull data for the period 1981-88 were analyzed by SIMCA principal components analysis and compared to patterns from sources after suitable adjustments for bioavailability and bioaccumulation. We concluded that an atmospheric combustion pattern (leaded gasoline, municipal incinerators, etc.) accounted best for the pattern in most lakes. Overlaying this was the high TCDD pattern in Lake Ontario and Saginaw Bay, clearly indicating industrial effluents from previous manufacturing of 2,4,5,-trichlorophenol. A poster on these results was presented at the dioxin '89 conference in Toronto and won first prize in the "Sources and Fate" category.

British Columbia

Double-crested Cormorant eggs from five colonies and Great Blue Heron eggs from eleven colonies on the Strait of Georgia, Fraser River and Vancouver Island were analyzed as part of the ongoing program to determine distribution, sources, and trends of PCDDs in this area. Eggs from all marine colonies contained detectable levels of 2378-TCDD, 12378-PnCDD and 123678-HxCDD in the 10-500ng/kg range. Eggs from a colony on a lake on Vancouver Island and near the Fraser River at Fort Langley had virtually undetectable levels. The most disturbing result was that TCDD levels had increased for the third year in a row in heron eggs from the U.B.C. colony. This may be an indication that TCDD contamination coming down the Fraser River is increasing.

In a joint project with Hal Rogers, Department of Fisheries and Oceans, West Vancouver, chinook salmon juveniles were exposed to diluted bleached kraft mill effluent for various times, and then subjected to a saltwater challenge test. Analysis of these fish indicated that they picked up very low levels of TCDD and TCDD compared to fish living in the Fraser River, indicating that uptake by gills is much less important than through food (stone fly larvae).

New coplanar PCB method

The newly developed coplanar PCB method was applied to a group of pooled samples from the specimen bank. Cormorant eggs from 1979/80 were chosen because samples were available from across Canada for this period. The 1988 Herring Gull egg collection was also analyzed, along with a Great Horned Owl egg from Saskatchewan, crab hepatopancreas from B.C., ringed seal from the Arctic, and coho salmon egg and alewife whole body from Lake Ontario. PCDDs were also determined in these samples if the data was not already available. Using factors from rat hepatoma enzyme induction (EROD and AHH) studies, the data were converted into toxic equivalents. In all cases, two PCB congeners (#126 and #105) accounted for 95% of TCDD equivalents. TCDD itself was only a significant contribution in ringed seal blubber. These results indicate that more concern needs to be focused on the possible effects of TCDD-like compounds. These results were presented at a special symposium on coplanar PCBs at the SETAC'89 conference in Toronto.

Circumpolar survey

Collection of fat samples for the circumpolar survey of contaminants in polar bears was begun in the fall of 1989. In addition to samples collected from carcasses by hunters in the N.W.T., biopsies of subcutaneous adipose tissue and some milk samples were collected as part of the research programs of M. Ramsay, University of Saskatchewan and I. Stirling, CWS, Western and Northern Region. The biopsy technique will also be used by the Norwegians to obtain samples from Svalbard. Agreement has been reached to obtain samples of fat from the U.S. Fish and Wildlife Service in Alaska, three areas in Greenland, and Wrangel Island in the U.S.S.R. during the course of the next year. R. Norstrom is one of three Environment Canada representatives on the Technical Committee on Contaminants in Native Diets and Northern Ecosystems, chaired by INAC. This committee has put together a draft research plan, in which the polar bear project, contaminants in waterfowl, and specimen banking are identified for increased resources in CWS.

Modeling contaminant uptake

Modeling of the uptake and clearance of contaminants in Herring Gulls moved into a new development phase with a Lotus 1-2-3- spreadsheet version by T. Clark, the contractor who developed the original HP-BASIC version of the model. The Lotus model allows "what if" questions (such as faster clearance rates, change in diet) to be asked, and have the results (e.g. levels in eggs) graphically displayed immediately, and makes it accessible to other research groups for the first time. The model is written for Lotus version 3.0, and in its largest form (20-year simulations) requires at least 2mB of RAM and a memory manager program to run. By reducing the number of years simulation, the model can be made to work with less memory. Using a

20mHz 80386 computer with math coprocessor and 8mB memory, the model takes eleven seconds to recalculate. Anyone interested in this model should contact R. Norstrom or C. Macdonald at NWRC.

Contaminants Evaluation

The Contaminants Evaluation Section, formed last year, is responsible for evaluation of the risk to wildlife from environmental contaminants. The section therefore initiates and coordinates monitoring and surveillance activities for detection of residues and bioeffects of existing chemicals on wildlife. It assesses new and existing chemicals, especially those listed on the Priority Substances List of the Canadian Environmental Protection Act (CEPA).

Three positions were staffed, head of a the section, a contaminants evaluator and pesticides technologist, and the section is at its full complement for 1990/91. In spite of the few people and the time taken up by staffing, the section was active on many committees and in research and monitoring.

This section is involved on the CEPA Priority Substances Subcommittee, which is responsible for the overall planning and coordination of interdepartmental activities on CEPA priority substances. Members of the section are leading two Priority Substance List task forces (chlorinated paraffins and methyl methacrylate), and are participating on task forces on chlorobenzenes, hexachlorobenzene, toluene and xylene. In 1989-90, a member from the section participated on the task force for dioxins and furans.

Contaminants Evaluation represents CWS on the committee evaluating new substances under SEction 4(6) of the Environmental Contaminants Act. This evaluation activity is designed as a screening and early warning regulatory process for identifying potentially dangerous new chemicals that may be released into the environment. Approximately 400 new chemicals were evaluated in 1989-90.

This section represents Environment Canada on the recently formed Biological Effects Subcommittee, which reports to the Ecological Committee of the IJC of the Great Lakes Science Advisory Board. In early 1990, this subcommittee organized an expert consultation to obtain advice on the ecology and status of Bald Eagle populations in the Great Lakes basin. The Bald Eagle has been recommended to the IJC as a sentinel species whose re-establishment and successful reproduction would indicate satisfactory restoration of the quality of waters of the Great Lakes.

A member from this section also served on a 5-member panel which conducted a peer review of the U.S. Environmental Protection Agency's Wildlife Toxicology Research Program at their Environmental Research Laboratory in Caravels, Oregon.

Biominitoring Strategy

A meeting was held between this section and the CWS regional biologists responsible for contaminants research and monitoring. The objective of the meeting was to review projects proposed for future research and monitoring, and to discuss future directions. As an initial step in developing a long-term biomonitoring strategy for CWS, literature was collected on biomarkers of potential value in wildlife studies.

Wildfoods

A growing concern about the quality of wild foods (such as waterfowl), consumed by the public as well as by native groups, prompted CWS to implement in 1988-89 a national survey of contaminants in waterfowl. The objective of the survey is to provide a comprehensive database on contaminants in waterfowl to Health and Welfare Canada so that the risk of consumption to human health may be assessed, and consumption guidelines may be established. Mainly herbivorous and omnivorous species (Mallards and Black Ducks) which are the most intensively hunted species in southern areas, were collected from popular hunting sites. In 1989-90 invertebrate and fish-eating species of waterfowl were collected from many of the same sites that were surveyed in 1988-89. As an adjunct study, gizzards from all of the birds collected have been sent to CWS, London, Ontario for fluoroscopic analysis of lead shot ingested by the birds. As well, some of the sampled waterfowl tissue is being sent to the Bureau of Radiation and Medical Devices, Health and Welfare Canada, for use in

their study of radionuclides in wild foods. A progress report on the results of the 1988 survey has been sent to the regions.

Studies

Studies on the bioavailability, hazard, and effects of environmental selenium on Canadian wildlife continued. In 1989, a literature survey was completed and the groundwork laid for the mapping of the distribution of seleniferous plants (Astragalus sp.) as indicators of bioavailable selenium using the two national herbaria located in Ottawa. A survey of selenium levels in the waters of 25 end basins in Saskatchewan known to be important to waterfowl was undertaken in cooperation with Inland Waters Directorate, Regina.

Ring-billed Gulls eggs were collected at known stages of incubation for the validation of the use of 3-hydroxybutyric acid as an indicator of fertility and early embryonic development in eggs that fail to hatch.

A member of the section continued to participate in the on-going CWS U.S. Fish and Wildlife Service study of deformities in Great Lakes cormorants. A contract was let to investigate the reproductive success and incidence of crossed bills in cormorants nesting in the boreal forest of Saskatchewan. No deformities were observed in 7000 chicks handled. Three multi-authored manuscripts were prepared in relation to this problem, for publication in the Journal of Great Lakes Research.

Manuscripts are in preparation on temporal and spatial variation in Vitamin A homeostasis and thyroid function in Great Lakes Herring Gulls. A paper entitled "Temporal and spatial variation in a battery of biomarkers in Great Lakes fish-eating birds in relation to known patterns of chemical contamination" was presented at international meetings.

A paper has been accepted for publication on the chronic toxicity of three PCB congeners to Japanese Quail. A second paper has been prepared on the chronic PCB toxicity to American kestrels. This work was also presented at the Society of Environmental Toxicology and Chemistry.

A study was completed that monitored the organochlorine levels in the blood of raptors migrating around the Great Lakes. An interim report was prepared and the work presented at SETAC. Results indicate that blood sampling of Sharp-shinned Hawks during migration would provide a cost effective means of monitoring persistent compounds in terrestrial birds. It was concluded that attributing organochlorine exposure to wintering versus breeding grounds was not possible using two sampling sites (one fall, one spring) because of the migratory nature of the hawk's songbird prey. A related study of organochlorine levels and effects in accipiter hawks in southern Ontario was also completed.

Technical reports published in 1989 include Review and Evaluation of the Amphibian Toxicological Literature (Report No. 61), Contaminants in the Prey of the Peregrine Falcon in Canada (Report No. 62), and The Use of Wing Parts for Monitoring Environmental Residues (report No. 63). A report on chemical residues in Canadian game birds has been revised and will also be published as a technical report.

Pesticides Evaluation

CWS and NWRC continued to provide advice on the impacts of pesticides on wildlife and wildlife habitat to various client agencies. The year was one of change, with one person on educational leave part of the time, another moving to Contaminants Evaluation Section and a new evaluator. Some time was devoted to training and making review procedures uniform within the section.

Active pesticied ingredient research

The section reviewed approximately 30 research permit application on 13 different active ingredients for Agriculture Canada. Seven new active ingredients were received for review and their data bases were screened for completeness. Emphasis for full product review was placed on a number of new biological agents including seven new strains of Bacillus thuringiensis (M-one, Trident, Foray, Foil, Condor, CIL-E2492 and MYX1806), a Sertifer virus, the herbicidal fungus BioMal and the protozoan grasshopper parasite Nosema locustae. Full

evaluations were also completed on the herbicides pyridate (Lentagran), Muster, and imazethapyr (Pursuit). Another 11 new active ingredients are in various stages of the review process and should be completed next year. Partial data reviews were also done on the products triclopyr (Garlon), pendimethalin (Prowl), diquat, MCPA, nuarimol, and fenarimol. CWS contributions to discussion documents on diflubenzuron (Dimilin), B.t. tenebrionis (Trident), and B.t. var. San Diego were prepared.

Insecticides and the Burrowing Owl

The situation concerning the Burrowing Owl demanded large time commitments. Research funded by CWS in past years had conclusively demonstrated serious impacts on the owls from the grasshopper insecticide carbofuran (Furadan). As a result of this and other cases of avian mortality, carbofuran is about to be placed under Special Review. CWS will be responsible for elaborating the risk case in this review. Over the year, CWS had several negotiation sessions with Agriculture Canada to try to restrict carbofuran use in the interim so as to protect this threatened species. The compromise reached involved the adoption of a label amendment which prohibits the use of carbofuran within 250 meters of any owl burrows. CWS is producing a pamphlet aimed at the user to publicize this label restriction. We are also producing a TV spot in cooperation with the World Wildlife Fund which, we hope, will air before the next use season. In addition, CWS funded a study to develop methodology using a Geographic Information System to determine risk to Burrowing Owls from insecticide use in Alberta. We also were given intervener status and presented evidence in the U.S. Scientific Advisory Board hearings on the special review of granular carbofuran.

Fenitrothion

Another special review to commence shortly concerns fenitrothion. The section was involved in drafting the document that demonstrated the need for a regulatory special review and helped draft the document announcing it. Again, CWS will largely be responsible for the risk case, as far as songbirds are concerned.

Guidelines development

Work progressed on the development of plant-testing guidelines for pesticide registration and under our guidance, a draft document was produced. It is currently under internal review. We organized a workshop to give background information on current plant data evaluation procedures and research in progress. A report which reviews plant-mediated impacts of herbicide use on wildlife is almost completed. We have spent considerable energy in developing the analytical methods to extract the valuable information from greenhouse screening studies conducted by companies in the early stages of product development. We also intensively reviewed existing protocols and associated literature on algal toxicity testing. A paper outlining the development of the plant testing guidelines was presented at an international symposium. Another paper on the selection of aquatic plant test species was co-authored for another symposium. Finally, a research project on improving algal toxicity testing for pesticide registration was developed in collaboration with the Saskatchewan Research Council.

We participated in a task force to develop guidelines for drift studies. To allow for continuity, the Contaminants Section will be representing us on the task forces to develop guidelines for the registration of microbials and genetically-engineered products. This has involved contributions to the guidelines for field trials of naturally occurring microbial pest control agents and to the guidelines for the registration of the same. Assistance was provided to organize the 1990 workshop on genetically modified microbial fertilizers and pest control agents. CWS was represented at a workshop on field testing of engineered plants and microbes, held at the University of Maryland.

Avian reproduction study

Work progressed on the analysis of the protocol for the Avian Reproduction Study (ARS), with statistical help from the Migratory Bird Surveys staff and the Applied Statistics group of the department. The intent is to publish most of this work in the next fiscal year. It will be divided as follows:

1. A review of the statistical methodology used to analyze the results from ARSs.
2. An analysis of the control data generated in the course of ARSs.
3. A simulation exercise to test the power of the ARS to detect reproductive toxicants.
4. A summary of the results of all ARSs made available to us (200 studies on two bird species) to see how many times they have triggered some concerns and comparison with mammalian reproductive toxicity endpoints.

Databases

Work was begun on establishing a database on residue levels of pesticides on plant and insect surfaces after application. The database covering published material from the past 20 years is almost complete. The next step in this project will be to search for and enter unpublished material, and statistically analyze the data. This information is needed to improve our ability to evaluate the toxic hazard of all pesticide applications. We provided information to COSEWIC so they can update the Endangered Species Database, previously established by us . Requests for advice were received by an environmental nongovernmental organization (MindFarers Inc.) and COSEWIC about the use and construction of the database.

Impacts of cholinesterase

A member of the Pesticides Evaluation Section organized a session on cholinesterases at the meeting of the Society of Environmental Toxicology and Chemistry held in Toronto. A contract has been signed with Elsevier to publish the proceedings of the session as a book tentatively titled: *Cholinesterase inhibiting insecticides: Their Impact on Wildlife and the Environment.* It will appear in an existing series on agricultural pesticides.

Organophosphate exposure

Research was also carried out on the effects of sublethal organophosphate exposure on reproduction and energetics in box-nesting Tree Swallows and on learning and memory in captive Black-capped Chickadees. The chickadee research was very useful in forging valuable links with the local bird-banding group because they volunteered their services in force. The chickadee work is being prepared as a doctoral dissertation. Health and Welfare Canada is helping with the logistics of that work, which is funded in large part by the World Wildlife Fund. It is too early at this stage to comment on the results of either study.

Agricultural practices and bird populations

Studies were continued to assess the impact of modern agricultural practices (particularly the use of pesticides and chemical fertilizers) on birds and their habitat, and to provide data for improving CWS assessments of potential risks associated with proposed chemical use patterns in Canada. A CWS technical report was drafted on wildlife use of habitats in agricultural landscapes in the Great Lakes, St. Lawrence region based on an earlier review of the scientific literature. Analyses of 1987-88 field data for selected crops in southern Ontario are to be published as a CWS technical report. A collaborative study in Saskatchewan (with CWS Western and Northern Region) was continued to assess the feasibility of establishing an Agricultural Bird Census in Canada. Analysis were completed in 1989 and tables of bird use by habitat type were generated. A field study was conducted in Ontario to evaluate the feasibility of comparing birds on organic versus conventional farms as a way of assessing impacts of pesticides and chemical fertilizers. Although the sample size was small, statistical analyses indicated that more bird species were observed at survey sites on organic farms that at corresponding survey sites on conventional farms. The total number of individuals observed at organic sites was higher than at conventional sites. Pairs of organic/conventional farms were identified in Saskatchewan for future study.

Publications and Communication

A number of scientific publications resulting from previous research activities were submitted or are in various stages of preparation. Two papers were submitted as part of the proceedings of the 1989 Prairie Conservation and Endangered Species Workshop. These will be published as an occasional paper of the Provincial Museum of Alberta. The studies showing the secondary hazard of fenthion to birds of prey have been written up as two draft papers and so were the results of the granule/seeding studies in wheat and canola. These should be published in refereed journals next year. CWS will also be well represented in the aforementioned book on cholinesterases. Finally, the Ontario Ministry of Agriculture requested our collaboration on a paper relating the recent cases of Canada Goose mortality on turf resulting from the use of the insecticide diazinon. This situation arose because the section has experience, having collaborated with the U.S. on restricting the turf uses of diazinon in that country.

As part of our efforts to increase the visibility of our group and improve communications with the agricultural sector, we organized visits in southwestern Ontario and the prairies to meet directly with farmers, pesticide applicators, company representatives, and agricultural researchers. The exercises were deemed a success by all concerned and will be repeated.

The section was also asked to respond to a number of queries coming from the Pesticide Review Board, which is currently re-assessing the pesticide registration process in Canada.

Finally, expertise was provided for a number of publications including a commercial book on birds around the home, a State of the Environment report, reports on pesticide hazards for Ducks Unlimited, and water quality guideline documents on selected pesticides (e.g.. simazine, cyanazine, picloram and metolachlor) for the Inland Waters Directorate. A strategy is being developed for the implementation of pesticide concerns into the North American Waterfowl Management Plan.

Laboratory Services

Laboratory Services provides a central service at NWRC to all of CWS for tissue preparation and specimen banking, chemical residue analysis, and stores all data in the National Registry of Toxic Chemical Residues.

Over 2900 wildlife specimens were received and approximately 2450 were processed, of which the majority were avian tissues. A portion of most samples were stored in the CWS Specimen Bank for future uses and 473 samples were analyzed in-house for organochlorine and PCB residues. Samples were submitted to private sector and university laboratories for analysis for organochlorine pesticidesCBs (125), dioxins (22), and metals (270). All results received from outside laboratories were subjected to quality assurance protocols.

Typical examples of the projects that we supported were as follows:

- analyses to assess the after effects of the fire at Saint-Basile-le-Grand, Québec
- analysis of eggs for monitoring projects of Herring Gull and other fish-eating birds from the Great Lakes
- archiving and analyses of various raptors such as Sharp-shinned Hawks, Prairie Falcons, Kestrels, Merlins and Bald Eagles
- preparation of pooled samples and analytical support to determine contaminants in various species collected as wild foods
- tissue preparation and analyses to support projects measuring dioxins in the B.C. environment
- organochlorine analyses to determine contaminant levels in birds from Atlantic, Arctic and Pacific coasts

- analyses of domestic ducks as a measurement of bioaccumulation at various sites in Québec

Opportunity was taken to obtain samples of pelicans killed by a hailstorm in Manitoba as well as abandoned eggs of various endangered species. These samples were obtained by the cooperation of provincial biologists.

Programming was started to more fully integrate laboratory results into the National Registry of Toxic Chemical Residues. A second project to keep better track of samples was also started. Retrievals from the registry were made to summarize data for wild foods and in support of Québec regional projects as well as to address other smaller requests.

A new, fully automated, gas chromatographic system was acquired to replace older equipment. An automated evaporator was purchased to improve productivity for extractions of tissues. An extension to the specimen bank was made by the installation of two - 150 freezers. These will allow tissues to be stored so that tests such as enzyme assays can be conducted at a later date. The computer network was again extended and now incorporates a link to DOTS. Laboratory Services holds a membership on behalf of CWS in the newly created Canadian Association of Environmental Analytical Laboratories.

Laboratory Services hosted, on behalf CWS and in cooperation with the Environment Division of the Canadian Institute of Chemistry, the 12th in a series of international seminars on specimen banking. This meeting was the first held outside the U.S. or Germany. About 40 representatives from Denmark, Finland, Germany, Sweden, the U.S. and various Canadian federal and provincial departments were in attendance. Several papers reflecting the Canadian experience of specimen banking and their uses were presented by NWRC staff.

A study was completed enabling the conversion of PCB results from the older Aroclor 1254/1260 1:1 mixture to the more modern method of summing the individual PCB congeners. This work was presented at SAC'89 Conference on Analytical Chemistry in Cambridge, England and is now being written up as a journal article. A second study on the precision and accuracy of the analysis of PCB congeners is almost complete.

Chapter 4

Program Analysis and Coordination Branch

National Program1.4
International Wildlife

Cooperative Agreements were signed with the USSR, Cuba and Peru and a proposal for a circumpolar agreement on wildlife and habitat protection was developed for tabling at the Canada-led meeting of the circumpolar, Arctic eight countries.

The CWS continued to support Canada's commitments under the Ramsar Convention on Wetlands of International Importance and provided additional assistance in terms of coordinating the production of the *Ramsar Newsletter* on behalf of the member Countries and facilitates a CIDA grant to assist representatives of less-developed countries to attend the Fourth Conference of the Parties scheduled for 1990.

National Program 2.1
Management and Administration

Research Strategy

The Program Coordination group focused much energy on developing strategies to guide CWS research and international activities. The CWS Research Strategy considers the roles, responsibilities and priorities for wildlife research. A key component of the Strategy calls for the establishment of a national network of Cooperative Wildlife Research Centres. The International Strategy lays the framework for CWS involvement in the international community and emphasises the need for closer cooperation with our circumpolar and western hemisphere neighbours.

Council of Wildlife Ministers

In response to the growing importance of wildlife issues in Canada, a Council of Wildlife Ministers was formed. Extensive support was provided to this Council and to the Wildlife Deputy Ministers' meeting which supports it.

Environmental Agenda

The Environmental Agenda took up a great deal of time and effort. Several products were prepared they are as follows:

- Wildlife Chapter
- CWS presentation on wildlife at Agenda team meetings.
- CWS chapter on wildlife
- CWS presentation on enforcement as part of departmental overview
- Chapter on enforcement and regulations
- Policies
- A fairly comprehensive CWS policy book was put together.
- CWS Executive Directors and Chiefs Committee Meetings

Much preparatory material and organization of an annotated agenda was completed for the Chiefs meeting in April, September and the CWS Executive Meeting in April, June and December.

The Chiefs' meeting in September included a workshop on northern issues: this provided material for inclusion in the Environmental Agenda/Arctic Strategy. The Chiefs' meetings have become more focused in 1989-90, with the intention of developing recommendations for the CWS Executive Committee (eg: oil spill response; development of CWS database on program activities). This will culminate in joint meeting with CWS executives planned for April, 1990.

Program Evaluation and Assessment

Natural Resource Component Evaluation Assessment

The member of the steering committee to review and direct the preparation of an assessment report on the future evaluation of the Natural Resource Component of C&P. Several versions were reviewed and a final will be completed by the end of this fiscal year.

Results Measurement Project

The Results Definition Model was implemented as the framework for operational planning and reporting in 1988. Phase II, involving the development of measures which assess the effectiveness of C&P programs, was initiated in January of 1989. The application of these measures will address central agency requirements (results-oriented operational planning framework as part of the Increased Ministerial Authority and Accountability exercise); will serve as a management tool (by identifying areas of potential weakness in program delivery and/or in the strategies for program delivery); and will be used as a means of communicating to external agencies and the public.

The CWS was represented on both the Working Group and the Steering Committee (H.A. Clarke) for this project. CWS's broad representation in the Results Definition Model required measures to be developed for most Effects (CWS has by far the largest number of measures accepted for implementation.)

Summary of Products

1) Measures were developed for each Effect of the Results Definition Model; a feasibility report documenting the rationale, data availability, costing and appropriateness of each measure was prepared; HQ and Regional input was ensured through consultations and distribution of drafts for comment; a schedule for implementation of these measures (beginning in 1990) was established.

2) Results Measurement Project received C&P Management Board approval in October. There has been subsequent refinement of measures.

3) Advance application of Results Measures: Main Estimates (Part III), Management Board presentations indicate usefulness.

C&P Management Board

The national overview of CWS operational planning was prepared for C&P Management Board, including analysis of regional long term operational plans (LTOPs), overheads (including graphs/figures describing issues and program results), and speaking notes.

Operational Planning

Operational planning and reporting cycle ran very smoothly this year (Priority Memo, LTOPS, Work Plans, Performance Reports). Highlights Charts produced for each of these proved useful in communicating concerns, strategies, activities and results, both externally and internally. Planning documents are now being used more frequently by staff to support their own initiatives.

Main Estimates Part III

Considerable effort was made in meeting Corporate requirements in the preparation of Main Estimates. Highlights of performance were supported by detailed interpretation of results and accountability (including graphical representation of program results and wildlife/habitat issues). Success in this endeavour was indicated by inclusion of CWS initiatives in articles in the Globe and Mail and Toronto Star newspapers.

Publications

There were several innovations in publishing during the year. A new CWS publications policy was approved in July. A data base of the entire inventory of 750 CWS publications was prepared so that the time-consuming manual operations of inventory updating and requisitioning could be computerized. Recycled papers were found and tested for the Occasional Papers, Progress Notes, and Hinterland Who's Who series; from now on, they will all be printed on paper containing approximately 50% recovered waste. New designs were also developed for the Occasional Paper and Hinterland Who's Who covers to use less ink and be more recyclable. The annual posters and abstracts containing migratory birds hunting regulations were also redesigned to be more environmentally friendly and to simplify handling requirements by Canada Post. They will also be printed on recycled paper from now on.

A total of 95 publications was produced during the year, including *The ecology and status of marine and shoreline birds in the Strait of Georgia, Contaminants in Canadian seabirds* (an SOE fact sheet) and an IWRB Special Publication, *Flyways and reserve networks for water birds*. Over 819 000 publications were distributed during the year, up from 795 000 last year.

Two new titles were added to the Hinterland Who's Who series: Lesser Snow Goose and Piping Plover. As well, a 60-second public service announcement on endangered species in Canada (promoting the HWW folder on the same topic) was prepared and distributed to television stations during National Wildlife Week.

Early in 1990 two publications produced by the division won awards from the Society for Technical Communication for their excellence in writing, editing and design: *Urbanization of rural land in Canada* 1981-85 (the first SOE fact sheet) and The importance of wildlife to Canadians in 1987.

Marketing

Marketing Strategy

A framework for a CWS Marketing Strategy was prepared. This is an overall framework identifying various media, target audiences in relation to the Results Definition Model. The strategy also identifies current areas of priority.

External Marketing

National Wildlife Week

a)National

- Coordinated CWS National Wildlife Week activities nationally.
- Events were held in atlantic region for the first time.
- Events were expanded in the western and northern region to cities outside of Edmonton.
- An event was also held at the Metro Toronto Zoo.

b)National Capitat Region

Ten government and non-government agencies participated. Events included exhibits, presentations, excursions and films. Approximated 34,000 people attended, a marked improvement over previous years. Public survey indicated a very high level of satisfaction of the program.

The CWS showed films from the International Wildlife Film Festival at Carleton University campus.

A senior producer from CBC and Parliamentary Secretary to the Minister were guest speakers at the opening. A dozen of the best wildlife films from around the world were shown at Carleton University.

Environment Week

CWS enhanced participation during Environment Week: Served on the C&P organizing committee, manned and exhibited several displays, and arranged for bird watching tours, etc.

Habitat 2000

Worked with Canadian Wildlife Federation (CWF) and Wildlife Habitat Canada (WHC) to distribute grants to schools across the country to improve wildlife habitat. Literally hundreds of classes have participated in the "Habitat 2000" program effecting thousands of square metres of habitat.

Wildlife Displays

Produced an exhibit on *Focus on CWS* which has been used in a wide variety of venues. Negotiated permanent display of Endangered Species Display at Spry Point Sustainable Development Cooperative in P.E.I. Reconditioned International Cooperation display (one of the remaining three CITES displays) and exhibited it at National Public Archives for entire month of August 1990.

A CWS display was produced for and exhibited at the National Capital Commissions's Fall Rhapsody program. Other displays were produced and exhibited at Western Quebec's Protestant School Board Annual "Global Day" Conference, the Ottawa Board of Education Sustainable Development conference for students, and the C&P Industry Market Week as well as coordinated CWS participation in workshops.

NAWMP input into and financial support for Agriculture Canada's Environment display was negotiated and coordinated.

External Affairs Canadian Industry Exhibition in Nuuk, Greenland

The CWS contributed a display to the Environment Canada initiative for the 4-day exhibition organized by External Affairs.

CWS Newsletter

The first issue of CWS national newsletter was introduced this year. The *GAVIA* will be published 3 times in the coming year.

2.2 Ecological and Economic Interdependence

Humane Trapping Program

The research and development component of Environment Canada's humane trapping program continues to be administered through the Fur Institute of Canada under the five-year agreement established in 1987/88. DOE and the International Fur Trade Federation (FIC) provided $460,000 and $400,000 respectively over this fiscal year.

The contractual agreement between the Fur Institute and the Alberta Environmental Centre was concluded in June, however, a new contract was established with the Alberta Research Council to administer the research which will continue in the outdoor compound facility at Vegreville. The ARC will bring important engineering and technology transfer expertise to the program that will ensure that trapping devices coming out of the research are manufactured.

Under the FIC/ARC program, research was carried out in the compound with trapping systems for arctic fox, raccoon and marten, all of which met with success. Trapline field studies will commence in the Fall of 1990. Also, the FIC/ARC program included an extensive field program in the Yukon to evaluate padded and standard leg hold traps for lynx. Mechanical Evaluation of several trapping devices was also carried out in the laboratory at ARC.

Laboratory work at Washington State University was successfully concluded on one beaver trapping device for underwater situations. Field studies on several traplines were also concluded and the data is being evaluated.

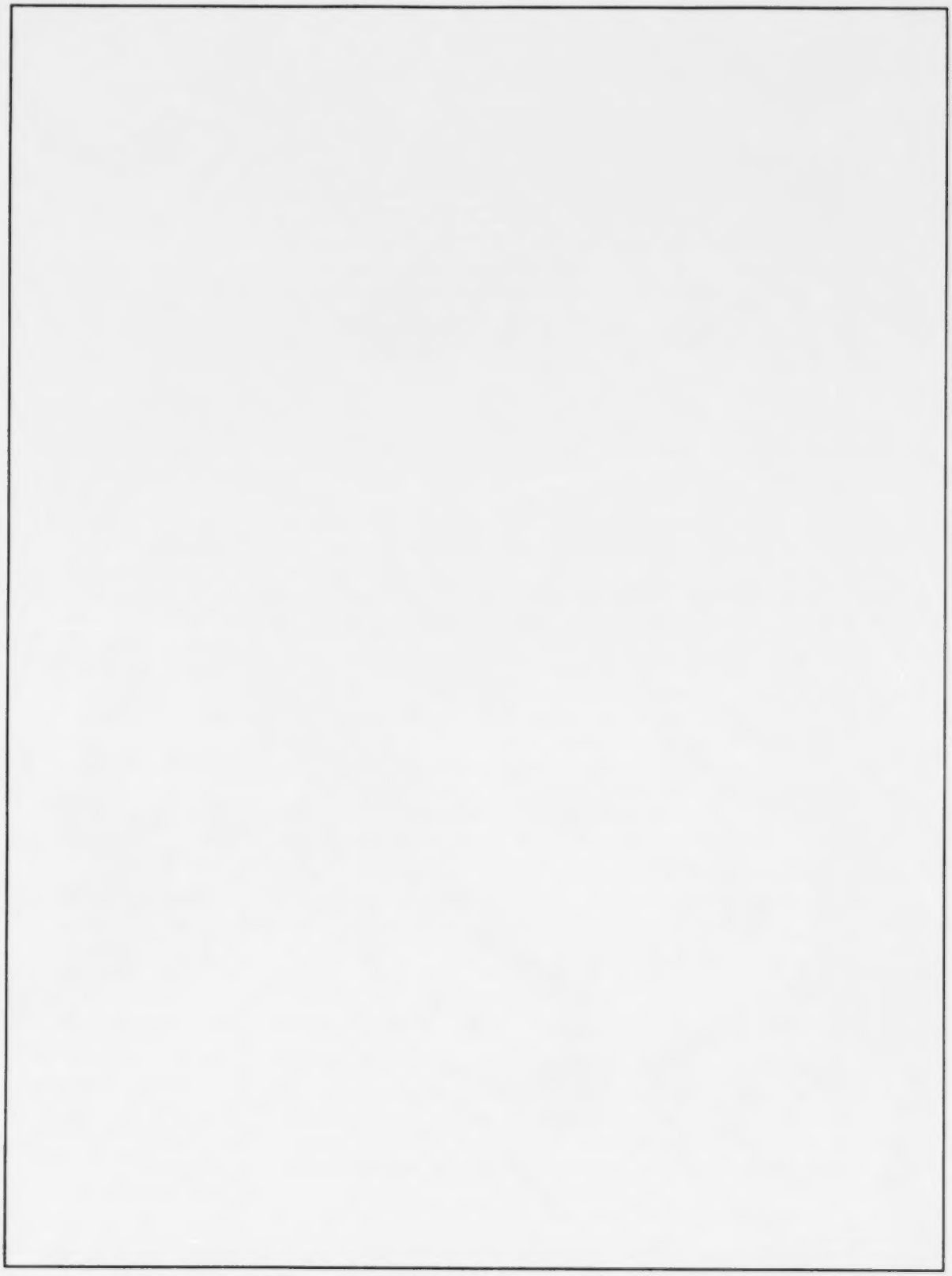
As a result of the research and field testing to date, the Fur Institute has made recommendations to the Ministers of Wildlife as to the appropriateness of specific trapping systems. Such recommendations will be made on a continuing basis.

Through an agreement between DOE and the Canadian General Standards Board, work is ongoing toward development of international humane trapping standards through a Technical Committee of the International Organization for Standardization. Canada chairs the Committee. Also work is proceeding on modification and updating of the present national humane trap standard.

Development of a national standard for trapper education programs and a trapper education instructor course was completed and turned over to the FIC.

An inventory of trapping activity on federal lands was completed with a view to developing, in consultation with provincial and other federal agencies, a uniform federal policy in this area.

cientific and Technical Publications



Chapter 5

Atlantic Region

National Program1.1
Migratory Birds

The highlights of the 1989 harvest strategy included delaying the opening of the season on Black Ducks in P.E.I.; major adjustments to seasons and zones in N.S.; and the closure of seasons on Harlequin Ducks throughout the Atlantic Region. We have presented proposals for the 1990 harvest season regulations to CWS and the public. Highlights include a reduction in bag limits for sea ducks and a re-definition of the hunting zones in Newfoundland.

Migratory Birds Convention Strategy

The strategy to amend the Migratory Birds Convention (MBC) has been prepared. Formal discussions were held with the provinces and U.S. officials. Reclassification of murres will be included in the discussions on the Protocol to allow native hunting in the North.

Annual Enforcement Plans

Annual enforcement plans were prepared, discussed, and agreed upon with the RCMP and the provinces. RCMP enforcement efforts increased as did compliance on the Acadian Peninsula in N.B. New CWS enforcement staff are now on duty (PM-5 and PM-3) and training courses for the RCMP and provincial officers have been completed. Headquarters staff joined with regional enforcement staff to address the market hunting issue in Newfoundland.

The development of a regional permits strategy has been initiated based on the new National Permits Policy.

Newfoundland / Eider Management Plan

A final draft of the Newfoundland/Eider Management Plan has been submitted to the provincial wildlife division for ratification. The second year of the Newfoundland eider enhancement project has been successfully completed with release of approximately 400 young birds hatched from eggs obtained from Quebec. Drafts of the Cape St. Mary's and Witless Bay management plans are complete after public consultation. Strategies for rebuilding Black Duck populations are contained in provincial Waterfowl Management Plans.

Waterfowl Management Plans have been finalized for all four Atlantic Provinces. They will guide regional initiatives under the North American Waterfowl Management Plan.

MBC Act Regulation Amendments

MBC Act Regulation amendments were finalized and gazetted. Draft regulations for 1990-91 have been discussed with the provinces and provided to CWS Headquarters and the public for review.

A very active program was developed for National Wildlife Week with communications staff (report available). A brochure was produced on Black Duck seasons in P.E.I. An oil/seabirds brochure is in draft form. Events including presentations by many staff members have been planned for 1990.

Waterfowl breeding pair surveys were undertaken in all four provinces. Preliminary findings indicate that Black Duck populations are increasing in N.B., stable in N.S. and Newfoundland, and decreasing in P.E.I.. Survey design has been revamped for 1990 and will be supported by funding from the Black Duck Joint Venture. Canadian woodcock surveys were completed and a report has been drafted.

Waterfowl banding field work has been completed, and two new banding stations were established. Preliminary results show a successful year, and reports are under preparation. Canada Goose banding was not very successful in P.E.I.; however, for the first time, neck collars were placed on geese in Newfoundland (Codroy Valley). A Prospectus for Northern Eider banding was developed and commented on by the Quebec and Western Northern regions and a second draft was prepared.

The Newfoundland Hunter Opinion Survey

The Newfoundland Hunter Opinion Survey has been analyzed and shows that Newfoundland hunters generally agree with our management directions. The National Species Composition Survey and Woodcock Wing Survey have been successfully completed. The murre harvest report is available, and other reports are under preparation.

The 1988 Breeding Bird Survey report and 1988 Maritime Nest Record Scheme report have both been completed. Two thousand shorebirds were banded in the upper Bay of Fundy in 1989, and a report has been completed. Standard techniques to band larger shorebirds were generally unsuccessful and new techniques will be developed and tried in 1990.

An analysis of gull and tern colonies in Newfoundland was completed. Surveys for phalaropes in Passamaquoddy Bay indicate a major redistribution, and plans have been made with our U.S. counterparts to attempt to to locate the birds in 1990. The Seabird Colony Registry has progressed to the output stage with analyses of over 300 Ontario colonies completed.

Seabird Conservation Workshop

An international Seabird Conservation Workshop and CWS Seabird Group meeting were held at St. John's, Newfoundland and a Seabird Research Strategy paper was produced. A position paper on Seabird Bycatch was completed and was introduced into the Marine Environmental Quality Agenda. The Seabird Distribution Atlas for Fundy-Georges Banks is near completion, to be followed by one for the Avalon-Grand Banks.

Forest Bird / Habitat Study

Funding for a Forest Bird/Habitat Study was not obtained, and a reduced program was undertaken in cooperation with. A National Songbird Program was developed which will determine CWS project direction.

The field work for the Fundy Eider Study has been completed, and data are being analyzed. Preliminary results confirm last year's findings that predation by gulls seems to depend on the availability of alternate prey. The Black Duck Study has been completed at Lepreau, N.B., results indicate different movement patterns on managed and unmanaged marshes.

National Program 1.2
WILDLIFE HABITAT

All regional regulatory requirements for the creation of two Migratory Bird Sanctuaries (MBS) for eider protection in northern Newfoundland have been satisfied and CWS Headquarters indicates designation by August, 1990 at the latest. New properties have been acquired at the proposed Portobello National Wildlife Area (NWA), and the additional Regulatory Impact Assessment Statement (RIAS) information required was forwarded to CWS Headquarters. The documentation for the proposed P.E.I. sanctuaries was forwarded to CWS Headquarters in 1988. Draft management plans have been prepared for Boot Island and Portage Island NWAs. A protection proposal for Grand Codroy has been completed and provided to all local residents for comment. Inspection/maintenance activities at NWAs have also been completed.

Revised harvest regimes were in place for the 1989 hunting season at Shepody and Wallace NWAs, and public consultation was continued. Land use permits on NWAs have been issued as planned. The visitor regulation at Machias Seal Island MBS was effectively administered.

The Eastern Habitat Joint Venture Prospectus

The Eastern Habitat Joint Venture (EHJV) Prospectus has been finalized and accepted by North American Waterfowl Management Plan (NAWMP) Committee. Second Step proposals were developed and submitted. First Step Agreements have been signed with N.B. and N.S. and a partnership was developed to launch the initial Newfoundland. project (Birchy Basin). A five-year operational plan for EHJV was submitted and work has begun on a 15 year plan. A regional EHJV coordinator has been appointed with plans for provincial coordinators developed.

Candidate Ramsar Sites

Six candidate Ramsar sites (Wetlands of International Significance) have been identified and a three-year action strategy has been developed.

Cape St. Mary's management plan and Witless Bay discussion paper were completed and released for public consultation. Meetings were held with the Codroy Development Association, protection options were explained and summarized for federal-provincial decision making. Information for the Regulatory Impact Analysis Statement on three MBSs were provided to the Office of Privatization and Regulation, Ottawa.

CWS has participated on the steering committee of the P.E.I. Watershed Management Program (1986-90) and has assisted in the field studies.

Wildlife Federation meetings in N.S., N.B. and P.E.I. were attended and presentations on EHJV were made. CWS participated in the regional promotion of National Wildlife Week (report available).

A draft communication plan and popular version of the EHJV prospectus were prepared. The plan was approved and is now being implemented.

The consultant's report on a wetlands inventory for insular Newfoundland was reviewed and it was decided to concentrate on organizing an inventory in Labrador with funding as a first priority.

Staff was not available to update the Maritime Wetland Inventory with water data as planned, however, a new habitat research biologist position has been staffed, thus increasing use and maintenance of the inventory. Wetland data for application to a Geographic Information System will be geocoded in 1990.

A program prospectus for a 5-year cooperative waterfowl habitat research project was prepared and submitted to Ducks Unlimited Canada (DUC) for approval. The project proposal has been approved for implementation in 1990.

Proposals for wetland fertilization research, prepared by the Acadia Centre for Estuarine Research, were reviewed and funding agreements have been made between all partners (Acadia University, Wildlife Habitat Canada (WHC), EHJV, DUC, N.S. Lands & Forests, and CWS). Implementation awaits funding approval.

National Program 1.3
Endangered Species

The first nesting of Peregrine Falcons in the region has been confirmed, with three nests discovered in N.B. The release program was modified with 25 birds released in 1989 (five in N.B., 20 in N.S.). The regional Piping Plover Recovery Plan was completed and will be published in May. Planning for the international Piping Plover census is underway.

The endangered species display has been on exhibit at three national parks and one national historic park.

The Atlantic Region contribution to the Common Tern Status Report has been completed. Key Piping Plover habitat in northeast N.B. were monitored with help from the Quebec Labrador Foundation. Reported peregrine nesting activities were investigated. Three sites have been confirmed, and adults have been observed at other sites. Labrador peregrine/harlequin surveys have been completed. A status report on the Harlequin Duck has been prepared for submission to COSEWIC.

National Program 1.4
International Water / Wildlife Resources

A CWS biologist from Western and Northern Region, under the direction of the Regional Director of CWS Atlantic Region has prepared a management plan for Bigi Pan Wildlife Area in Suriname. Government approval has been obtained. An agreement has been drafted for migratory bird conservation with St. Pierre and Miquelon. A proposal for an agreement with Greenland and Iceland was submitted to CWS Headquarters.

George Finney was elected to the Chair of Western Hemisphere Shorebird Reserve Network Council; several meeting have been held. Two new hemisphere reserves have been established in Argentina and the U.S.

Two hundred puffin chicks were transferred to assist U.S. reintroduction efforts, and the situation in Maine indicates that further transfers can be soon discontinued. The updated report on the Puffin Reintroduction Study was completed.

National Program 1.5
National / Regional Water and Wildlife Resources

Positive discussions have been held with N.B. officials about a Wetlands Designation Agreement, an interim steering committee has been established, and a draft agreement has been prepared and is under provincial review. It is now up to Inland Waters to take the lead in designation agreements. The agreement has been included in Annex II of the proposed N.B. Accord.

The Atlantic C&P Wetland Conservation Program Action Plan was delayed due to efforts to get EHJV organized and, planning was rescheduled for 1990. Cooperative projects with provinces and nongovernmental organizations were developed and implemented under EHJV and WHC, and several ongoing projects were extended to interested cooperators, such as local fish and game and naturalist clubs.

Significant progress has been made in the development of the Atlantic Estuary Joint Venture. Three pilot areas have been targeted: the Annapolis-Cornwallis, led by the Annapolis Valley Board of Trade; the Nepisiquit River-Bathurst Estuary, for which a concept paper is being produced; and the Wilmot-Dunk Rivers, P.E.I.

National Program 1.6
Natural Hazards

Report on the loss of mussels to sea ducks in N.S. has been completed with Federal/Provincial Fisheries Agreement funding and CWS supervision. A seminar on the subject was given to the School of Fisheries in and advice has been given to Newfoundland, N.B. and N.S. aquaculture regulators. The Gull Management Plan has been finalized. It provides for short term controls to protect other bird species and long term initiatives to control gull proliferation.

CWS inspected airports in N.B. and P.E.I. and provided advice on avoidance of aircraft-bird problems. We also provided advice and information to a contractor investigating bird hazards at CFB Shearwater.

National Program 2.1
Management and administrative support

CWS staff took DOTS training in July 1989. DOTS equipment was installed in August 1989.

The Sackville Regional Office obtained new warehouse space in November 1990. CWS, St. John's occupied new offices in March 1990.

Staff attended a stress management seminar in December 1989.

National Program 2.2
Ecoiogical and Economic Interdependence

Work is progressing on schedule for the 1990 Regional SOE Report with solid support from other government departments and the provinces. The first draft of the CWS section has been completed.

CWS participated in a workshop convened by Atlanic Canada Opportunity Agency (ACOA) to address concerns of the Labrador Outfitters Association and adventure tour industry. Enhanced migratory bird enforcement and opportunities to expand their industry into waterfowl hunting were called for.

Staff actively participated in National Wildlife Week activities, including mall displays, tours of wetlands and the CWS offices and other events such as Shearwater Air Show (55 000 visitors to display) and Islander Days at P.E.I. National Park (5 000 visitors). Public awareness of our mandate was enhanced through these activities.

National Program 3.1
Environmental Impacts of New Initiatives

A mechanism has been developed for the assessment of potential environmental impacts of in-house and associated projects, such as EHJV.

An environmental impact statement on military low-level flying in Labrador has been critiqued and recommendations provided.

National Program 3.2
Air and Water Emissions / Effluents

"Keji 88" proceedings were published in a scientific journal in January 1990.

Field surveys, data analysis and progress report of loons and other waterfowl in Kejimkujik calibrated basin were completed on schedule. A paper on the use of aquatic birds as trophic indicators of lake productivity was presented at an international symposium.

A final report on the effects of acidification on the productivity of wildlife habitat and food in Kejimkujik, N.S. was delayed due to key staff changes; draft report is now completed and will be finalized in April 1990.

National Program 3.3
Toxics

CWS initiated formation of a committee to develop CEPA research and monitoring. The committee reports to the Regional Toxic Chemical Committee. A strategy and action plan was developed and approved by management.

A report *Long term monitoring of chemical contaminants in seabirds* was published in a scientific journal.

Hunter-shot waterfowl samples were collected at five sites. Specimens were sent to National Wildlife Research Centre (NWRC) for analysis of organochlorines, including dioxins and furans, and heavy metals. A report was prepared on those results and distributed. Development of a strategy for restrictions is progressing. Follow-up studies are being planned.

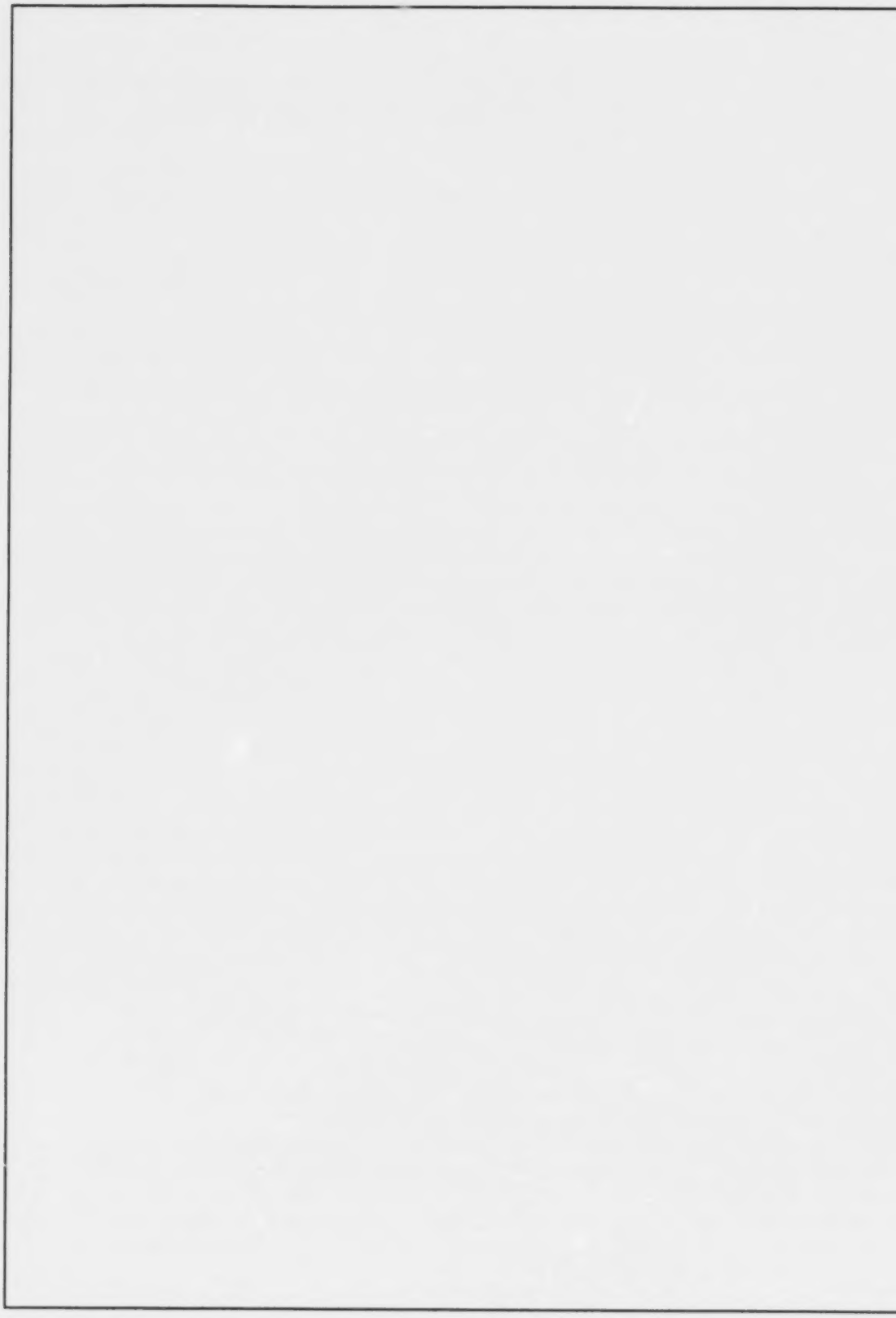
Blood samples from waterfowl collected from hunters and through the banding program were analyzed for lead levels at the Atlantic Veterinary College. Contamination levels indicated problem areas for which management options are now being developed.

CWS gave a priority to preparing technical papers on fenitrothion use based on current data. Three papers were written, submitted, and accepted by respected journals. Papers should appear in print in 1990-91.

At the request of Environment Canada, Agriculture Canada agreed to initiate a special, early re-evaluation of forest use of fenitrothion. This indicates that Agriculture Canada believes that there may be good reasons for Environment Canada's concerns about continued use of fenitrothion.

The Province of Newfoundland publicly declared that they would not use fenitrothion because of environmental concerns. They now use only B. t. for forest spraying (a small Hemlock Looper program).

Biologists collected eggs of fish-eating birds at four sites and sent them to NWRC for analysis of dioxins, furans, PCBs and organochlorine pesticides. Analyses are completed and reports have been circulated.



Chapter 6

Québec Region

Regional Overview

The year 1989-1990 saw a particularly large number of accomplishments and significant events: the St Lawrence Action Plan (SLAP) and the North American Waterfowl Management Plan (NAWMP), on top of our regular activities, enabled our regional team to demonstrate its skills and ability to get things done.

The SLAP really took off this year and a number of results have gratified the remarkable efforts of the whole team. Five hundred hectares of major waterside and island habitats have been acquired or will be soon. The objectives of the habitat management and acquisition assistance program have been achieved, despite a late start in October, and seven projects submitted by conservation groups received contributions. This innovative program, with a $600,000 fund spread over four years, provides two kinds of aid to not-for-profit organizations: in managing and improving habitats, and acquiring habitats. A second workshop on preserving habitats, long awaited by the groups, was held in November, bringing together 50 or so conservation organizations. The Habitats newsletter, launched at that workshop, is published three times a year, and links the various parties involved: government departments, foundations and private groups.

Efforts to develop specialized skills in wetland maintenance and rehabilitation of degraded areas have met with great success: major funding for several pilot projects was obtained from SLAP management for the next three years of the Plan.

The first list of threatened birds of Québec, a publication concerning birds throughout Québec, but which pays particular attention to those nesting along the St Lawrence corridor, was released on June 28. Media coverage of the event was so successful that we received close to 4,000 orders in just a few weeks.

As part of the pilot project run by the Canadian Wildlife Service (CWS) and the Canadian Parks Service (CPS), 20 young Peregrine Falcons were released in Forillon National Park; this large-scale release was the last stage in the CWS's Québec release program. The list of Québec's threatened birds also confirms the notable improvement of the situation of this species, which has been characterized by successful breeding in southern Québec for several years.

Communication, an essential tool in the conservation of endangered species, was put to very good use to help save the Piping Plover, which now is found only in the Magdalen Islands; a widespread public awareness campaign this summer invited islanders and tourists to take concrete action to protect this species, unfamiliar to most members of the general public.

The Québec Breeding Bird Atlas, a major collective undertaking, is now complete, and the results of this tremendous effort are being prepared for publication. To start meeting the various expectations of the general public and ornithologists immediately, the CWS will soon make the data and distribution maps accessible by computer.

The twentieth anniversary of the Cap Tourmente National Wildlife Area (NWA) was in 1989, and a great many activities of all kinds were held throughout the year to mark the occasion. The simultaneous inauguration of a network of six centres for cleaning oiled birds, at Cap Tourmente and the other centres, received absolutely superb media coverage. It should be remembered that this initiative, a first in this country, was made possible by an impressive group of contributors from both the public and private sectors.

This regional overview would not be complete without mentioning the North American Wildfowl Management Plan (NAWMP), which is finally getting off the ground. All the mechanisms are now in place for all the joint projects; the initial Eastern Habitat Joint Venture (EHJV) is now almost completed and the five second-stage projects are well under way. Québec's special contribution to the Black Duck Joint Venture (BDJV) should also be mentioned. The methodology developed in our region is being used by all Canadian and American participants in the population survey of this species throughout eastern North America.

National Program 1.1
Migratory Birds

Regulations and Enforcement

The addition of two new people to the Regulations and Enforcement Section enabled us to restructure the section significantly: under the direction of a Chief Co-ordinator, two Regional Co-ordinators were assigned to the Lower North Shore and the Lower St Lawrence. These new arrivals made it possible to increase the number of meetings and contacts with partners and clients; the section was able to take part in a number of outfitters' trade shows, camping shows and other trade fairs organized for wildfowl hunters.

Procedures for issuing permits -- a considerable job that affects mainly bird breeders, who alone make up about 800 of the over 1,200 permit holders -- will soon be modified again to make them simpler and easier.

The numbers of seabirds and eiders continue to increase on the North Shore, thanks to better co-ordination of efforts and initiatives. The active presence of CPS officers in the Mingan Archipelago has obviously had something to do with the significant rise in eider populations in the area. A public awareness campaign has also been launched: posters and leaflets were distributed in the spring, mainly on the Lower North Shore and on the Indian reserves, since eggs are still collected and moulting adults are still hunted in these areas.

Annual Regulations

The planned annual consultation concerning hunting regulations applicable in the fall of 1990 is under way. The Ministère du Loisir, de la Chasse et de la Pêche (MLCP) has agreed in principle to the CWS's new proposals, which are currently being examined by the Québec Wildlife Federation and other private groups. L'Association québécoise des groupes d'ornithologues, which represents most ornithologists' clubs, received the proposals very favourably. The main intent of the proposals is to make the day the hunting season opens the same throughout the Québec-Ontario border areas and to reduce the pressure of the hunt on wild geese to encourage them to stay longer in our areas, thus favouring local hunters.

Publications

A number of important scientific publications are being prepared. The findings of work on the status of seabird populations in the Gulf of St Lawrence and the data from the thirteenth population survey of seabirds in the North Shore sanctuaries will soon be published. A publication on birds that winter along the St Lawrence is planned, and an article on the avifauna of Akpatok Island (Ungava Bay) has been submitted, as well as the report on studies of Thick-billed Murres carried out on the same island in 1981, 1982 and 1987, which will be published as a CWS Occasional Paper.

The monograph on the status of Black Duck populations, which should be published soon, will analyse the findings of the five years of surveys of Black Duck populations in the boreal forest and assess the development of the populations of the species.

The Québec Breeding Bird Atlas is now completed and the publishing process has begun; the maps are ready and most of the illustrations required are in production.

Research and Population Surveys

Game Birds

Black Duck

The fifth population survey of Black Duck breeding pairs was conducted in May and the entire five-year program has enabled us to measure a significant increase in populations in the boreal forests over this period. A new program to monitor populations has been developed and implemented in co-operation with the Ontario and Atlantic regions as well as the US Fish and Wildlife Service and the State of Maine. This new population survey, which covers all of eastern North America, is part of the Black Duck Joint Venture. It will be conducted using the population survey method developed over the past few years by the Québec Region.

The Co-operative Banding Program continues. As part of the review of the North American Banding Program, the inland night-banding method has been tested and the feasibility of applying this new technique in remote regions has been assessed. The results of the analysis of hybrids captured during banding operations and the criteria used to identify types of plumage were presented at the Black Duck Symposium held in New Brunswick.

Studies of the habitat used by the Black Duck nesting in the boreal forest enabled us to develop logistic models for classifying the potential of various environments to support this species with a given degree of accuracy. This approach, which makes use of satellite imagery, opens up new possibilities for evaluating the habitat over large areas. A video on the subject was produced and presented at the Black Duck Symposium this winter.

An analysis of the habitat in over 200 sample areas along the St Lawrence and its principle tributaries was produced in order to monitor breeding pairs of ducks and measure the long-term use of various types of environments by wildfowl.

Woodcocks and Shorebirds

Projects to monitor and survey the American Woodcock population in the spring on the singing grounds and in autumn during hunting season continued this year with the help of volunteers.

Regular population surveys of shorebirds observed along the mudflats of the estuary and gulf were also conducted, in midsummer and in late autumn at about 20 sites.

Geese

Various studies of Anserinae were conducted over the year. The 1989 spring survey of the Greater Snow Goose population (over 360,000 birds observed) found that the species was more abundant than ever. In co-operation with Laval University, the second stage of a two-year study on the food ecology during the breeding season and the ecology of raising young in nesting areas was conducted on Bylot Island, in the Arctic.

A survey of Brants and Canada Geese observed on the great plain of Kuujjuaq was conducted over the summer. The presence of wild geese in agricultural fields in the Kamouraska area was monitored in the spring with the help of local organizations.

In the fall, the geese's productivity continued to be assessed by counting the families and monitoring the number caught by hunters at Cap Tourmente.

All the data accumulated on the dynamics of the Greater Snow Goose enabled our Chief Researcher to update the population model for this species and to make a presentation on the current situation and management possibilities at the International Union of Game Biologists' conference held in Norway in September.

A preliminary study of the diet of the Canada Goose along the James Bay shore was conducted in the spring and an agreement was reached with the James Bay Energy Corporation to publish a map of coastal habitats.

Eiders

As part of the CWS-CPS pilot project, the data from the survey of eider populations in winter was analysed with the CPS in the Mingan Archipelago-Anticosti sector. We were thus able evaluate the photographic surveys, the exactitude of visual estimates and the usefulness of multiple counts of the same flocks with a view to a general assessment of the number of birds in a region.

Seabirds

A survey of the various populations of seabirds was conducted in the Gaspé and the Baie des Chaleurs. The main outcome of this work was to locate new colonies and to observe a very significant increase in the populations of Black-legged Kittiwakes, Double-crested Cormorants, Common Terns and Common Murres since the last population survey data was gathered in 1979.

Gannets

The findings of the five-year study of the productivity of gannets on Bonaventure Island, begun in 1986, were excellent this year: hatching and fledging rates were very high and net productivity was 72%. This percentage was higher than the minimum level needed to maintain the population. The project also included toxicological work, so eggs were collected to be analysed for contaminants.

This monitoring of the Québec population was backed up by a photographic survey of colonies on Anticosti Island, Rocher aux Oiseaux (Magdalen Islands) and Bonaventure Island. The counts indicate an increase in gannet pairs on Bonaventure Island, from 21,090 to 24,125 pairs, or an annual increase of about 2.8%. A comparable rate was recorded on Rocher aux Oiseaux.

Razorbill

The Razorbill banding program (adults and juveniles) on the North Shore, begun in 1986 in the sanctuaries on le du Corossol and the les St Marie, continued this year with the banding of close to 500 birds, our highest number to date. This year we added something new -- coloured bands that will enable us to identify birds by their nesting sites. This measure is the first step in a long-term study on the interaction of commercial fishing with seabirds, notably Razorbills.

Landbirds

The compilations of data in the Breeding Bird Atlas database have reached the final stage. More than 175,000 new data items have been updated and the database became accessible to the public starting in the spring of 1990. Some 280 species of nesting birds have been mapped and the Atlas illustrations of each species are being produced. The camera-ready copy of a map of southern Québec, including the 2,500 census units, has been produced and will also be available for public consultation. A geostatistical method has been developed to analyse the distribution of birds. Finally, the information to be presented on each species and possible ways of writing the Breeding Bird Atlas have been decided upon.

National Program 1.2
Wildlife Habitat

St Lawrence Action Plan – Habitat Conservation

The year 1989-1990 was marked by major initiatives in conservation of Québec habitats.

The SLAP enabled the NWA territories at Cap Tourmente and Baie de l'Isle Verte to be consolidated. At Cap Tourmente, a large agricultural field frequented by Snow Geese has been added to the sanctuary, thus maximizing the habitat available for this growing population. A total of 300 ha of important wildlife environments have now been added to the current network of the eight NWAs in Québec. In the Montreal area, steps are being taken to apply a new integrated conservation concept in the archipelagos between Montreal and Sorel. More generally, for the entire St Lawrence corridor, discussions are taking place with SLAP partners to determine which habitats should be given priority for acquisition, considering the species of flora or fauna that are vulnerable or threatened, as well as the environments considered to be essential to saving the St Lawrence.

Eastern Habitat Joint Venture

The EHJV is now well under way. The CWS and its partners (MLCPQ, Ducks Unlimited Canada, Fondation de la Faune du Québec, Wildlife Habitat Canada, Office de planification et de développement du Québec) have invested time and money in carrying out the Baie du Febvre project on Lake St Pierre and beginning second-stage projects. Methods of action were being fine-tuned all year long. We are now ready to go full steam ahead and apply all the energy required to this far-reaching project.

Habitat Management and Acquisition Assistance Program

The implementation of the program to assist conservation groups proposed as part of the SLAP was received with a great deal of enthusiasm. It fills a number of gaps in the CWS Québec Region that were pointed out at the first workshop for groups, held in December 1988. In the same spirit, the CWS organized a second workshop in November 1989, focusing on habitat conservation and management. On this occasion, it launched the new program mentioned above, which was given concrete form by the allocation of contributions totalling $94,000. The Habitats newsletter, published three times a year, was started up to provide communication among the groups.

The SLAP also made it possible to develop expertise in maintaining wildlife habitats, an initiative that for the first time in Québec will provide the tools needed to restore habitats that have been damaged.

Communications and Marketing

Cap Tourmente NWA's 20th Anniversary

In 1989, the 20th anniversary of the Cap Tourmente NWA was also celebrated. Many dynamic promotional events marked the occasion. The interpretation centre exhibition was completely redone, and the centre for cleaning birds in case of oil spills – part of a network of five other similar centres along the St Lawrence -- was inaugurated, an outdoor stand focusing on the St Lawrence and Québec NWA network was put up, and a poster and brochure on the NWA were published.

CWS-CPS Pilot Project

The CWS-CPS pilot project will continue for a second year with the organization of many joint activities, such as the twinning of the Cap Tourmente NWA and La Mauricie National Park, promotional events, and the large-scale releases of Peregrine Falcons in Forillon National Park. The links between the two services have been forged and there are daily contacts at every level. We find that the pilot project has been a success, and we would not hesitate to recommend implementing others in other regions.

Composite Map of St Lawrence Conservation Priorities

A completely new project has been added to the SLAP: a composite map of the St Lawrence and southern Québec, illustrating various key elements in the status and evolution of the river system. For example, it shows details on the size and location of the plant life in intact or disturbed wetlands, areas currently protected, areas to be given priority for protection, and nesting sites of colonial birds. This map is both a management tool and a means of disseminating information and increasing public awareness.

National Program 1.3
Endangered Species

Public Awareness Campaigns

The most significant event this year was the launching in June of a publication on endangered species of birds in Québec. Public demand was exceptional; over 3,800 orders were received, which demonstrates the keen interest of Québecers in their endangered wildlife. The publication has now been reprinted and is being distributed.

Three species are considered to be endangered -- the Piping Plover, the Caspian Tern, and Loggerhead Shrike -- and two species are threatened -- the Bald Eagle and the Roseate Tern. The most significant of the vulnerable species is the Peregrine Falcon: efforts to reintroduce this species in Québec since 1976 have been so successful that we are now able to take it out of the "threatened" category. It should also be noted that this status applies to two subspecies that nest in Québec.

The implementation of survival plans for the Peregrine Falcon and Piping Plover has continued. Large-scale releases of 20 young falcons took place in Forillon National Park. A dynamic public awareness campaign concerning the Piping Plover was conducted in the Magdalen Islands in conjunction with a local association. Several activities were held: clips, radio announcements and descriptive signs were produced, and steps were taken to make islanders and vacationers on the beaches aware of the birds. A study of the productivity of the species was also conducted, which should tell us more about how it behaves in its Magdalen Island habitat so we can try to take appropriate corrective measures.

We have also begun the work necessary to implement the survival plan of the Loggerhead Shrike, for which a major effort to locate the species and its habitats is necessary in order to define the problems and find solutions.

Finally, we have begun to work with the Ministère de l'environnement du Québec (MENVIQ) to start a program to conserve rare and threatened plants in Québec, and we have supported the efforts of the Nature Conservancy of Canada to establish a Centre de données sur le patrimoine du Québec [Québec Heritage Data Centre] in co-operation with the MENVIQ. Among other things, we provided special access to various CWS-Québec databases and a great deal of unpublished data on the flora and fauna.

2.2 Ecological and Economic Interdependence

Research on Ecosystems

The subdivision of the St Lawrence into biogeographic regions is the cornerstone of the part of the SLAP program that concentrates on assessing ecosystems. Piloted by CWS-Québec, this major project is now completed and available in the form of an excellent technical report that includes an impressive amount of data.

In addition, various attempts were made to identify biological parameters that could be used as indicators of the integrity of the St Lawrence ecosystems. The concept of ecosystem integrity, developed by CWS-Québec, should make it possible to measure the health of these ecosystems fairly precisely.

National Program 3.2
Effects of Emissions and Effluents on the Air and Water

Research on Contaminants

The research project on the impact of the dying maple groves on birds is now completed. Conducted by a graduate student at Laval University with the backing of the CWS through the Unsolicited Proposals program, it made it possible to observe and report on the reactions of three species of insectivorous birds typical of maple groves (Least Flycatcher, Black-throated Blue Warbler and Red-eyed Vireo).

On the regional level, the total numbers of species and of breeding pairs does not vary as a function of the dying trees. Although the Least Flycatcher shows a tendency to decline in dead maple groves, the breeding rate of the species does not differ significantly from one type of site to another.

Specimens were captured in six areas of Québec, including James Bay, as part of the national survey of contaminants in waterfowl.

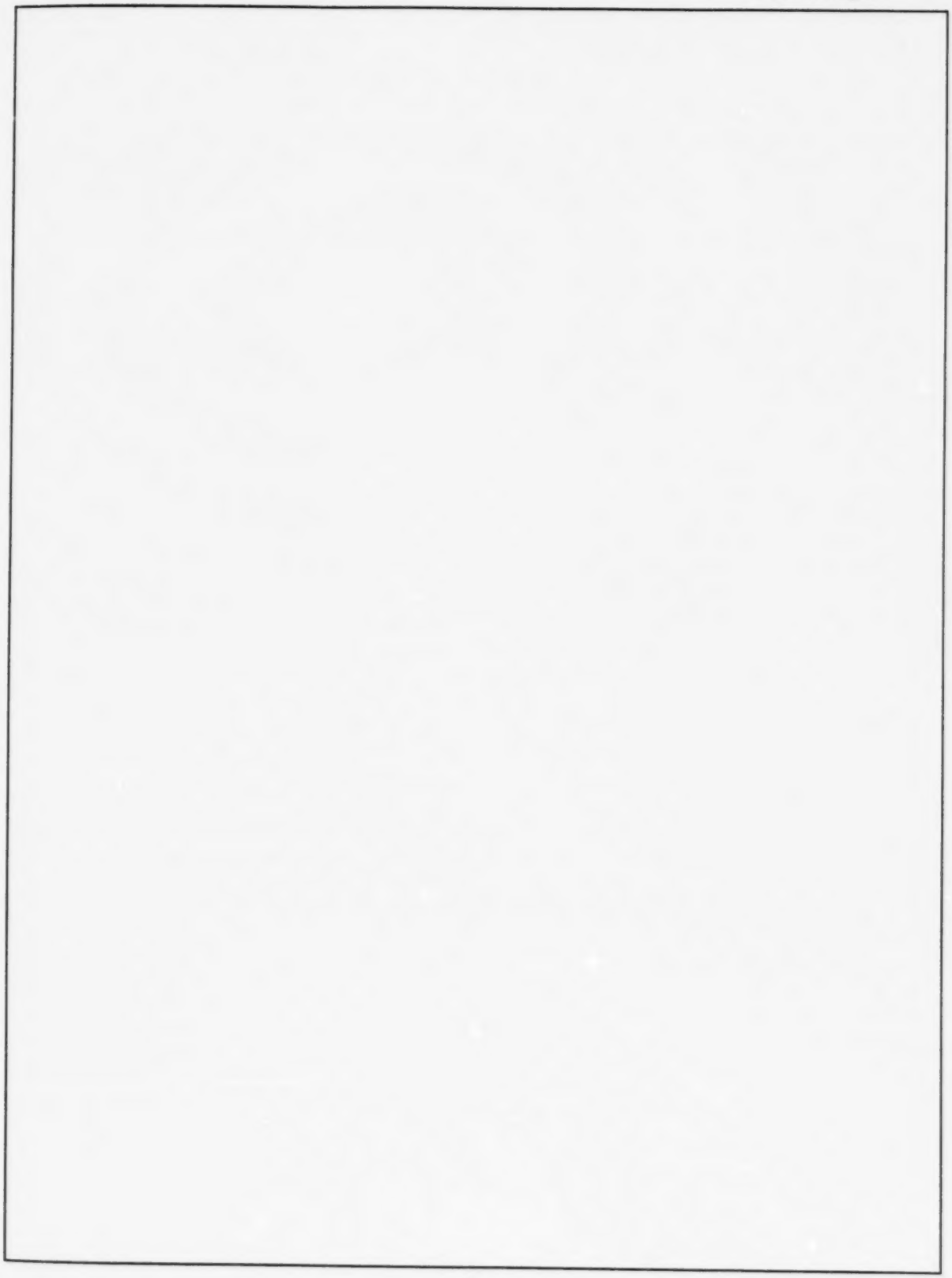
National Program 3.3
Toxic Substances

Research on Toxic Chemicals

In order to establish a series of bioindicators of the contamination of ecosystems by toxic chemicals, we continued to evaluate certain species of birds, reptiles and other amphibians in conjunction with the St Lawrence Centre. A history of the use of various species as bioindicators for the study of the Great Lakes-St Lawrence system was written at the same time. These two projects were presented at the symposium on the St Lawrence held as part of the Québec Biologists' Association conference.

We also conducted three new experiments to assess the impact of pesticides on the environment. The studies bore on lawn treatment in cities, potato farming and Christmas tree production.

Finally, a pilot study was conducted with Hydro-Québec to determine the ecological tendencies and consequences of the increase in methyl mercury after large hydro-electric reservoirs were brought on stream in northwestern Québec. The Osprey turned out to be a good species to use as a bioindicator for this type of study.



Chapter 7

Ontario Region

National Program 1.1
Migratory Birds

North American Waterfowl Management Plan Implementation

The second year of a three-year study of waterfowl distribution and productivity in the Ontario portion of the Great Clay Belt was completed. The purpose of this work is to determine waterfowl breeding density, distribution, and level of productivity, and to relate these parameters to habitat types. Field work comprised three helicopter surveys of study plots throughout the Clay Belt; these included an initial breeding pair survey in spring followed by two brood surveys during the summer. Results indicate a substantial rise in breeding numbers since the previous year. Habitat characteristics, particularly of the shoreline, are being determined through interpretation of air photos and video tapes of the plots, and will be related to LANDSAT imagery of the whole study area. A wildlife habitat cover map will be produced from this analysis. This work involves the collaborative efforts of Ducks Unlimited, Ontario Ministry of Natural Resources (OMNR) Wildlife Habitat, Canada and the CWS.

The southern section of a special survey area established in 1987 in northeastern Ontario was re-surveyed in order to monitor the population trend of the Black Duck, a species that has shown a general long-term decline on the wintering grounds. No changes could be discerned in either Black Duck or Mallard populations over the duration of the survey. All other species of waterfowl plus Common Loons were also recorded. This was the last year of coverage for this survey; in future, this area will be covered using a new but related sampling regime as part of the operational surveys of the Black Duck Joint Venture.

In southern Ontario, 1 919 ducks were banded as well as 2 346 local Canada Geese. The Canada Geese were colour-marked with green plastic leg bands. (Despite the departure of Canada Geese due to cold weather in December, a relatively high portion of colour-banded birds were observed along the Thames River during routine surveys).

Aerial surveys were begun on the wetlands of Lake St. Clair to document changes in waterfowl use and land use since 1982, the last time the area was surveyed on a routine basis.

Throughout the province, survey staff participated in the Continental Canvasback Survey, the Mid-December Canada Goose Survey and the Mid-winter Waterfowl Survey, the latter two in cooperation with the OMNR.

Lead Shot

As a result of recent losses of waterfowl at Lake St. Clair to lead poisoning, portions of Kent and Essex counties near the lake will be zoned for nontoxic shot beginning with the 1990 hunting season. Pathology work conducted on incapacitated birds collected near the end of the 1989 hunting season showed that 71.4% were incapacitated by lead poisoning, whereas only 11.4% were incapacitated as a result of gunshot wounds. Gizzards were collected from additional areas in Ontario in the 1989 hunting season, but analysis has not been completed at present.

Colonial Waterbirds of the Great Lakes

The first year of a three-year inventory of all colonial waterbirds in the Great Lakes was successfully completed. This project is carried out simultaneously in the Canadian portions of the Great Lakes (with CWS as lead agency) and in the U.S. portions (with USFWS as leader). The work in Ontario is a joint CWS/OMNR/Parks Canada undertaking. Twelve teams were in the field during the 1989 breeding season, and at present the data are being analyzed. (Formal publications will be prepared upon completion of the three-year project).

A paper on the biology of Common Terns and Elegant Terns wintering in Peru was published. Two manuscripts were submitted for publication: one on the importance of sand crabs for resident and migrant larids in Peru; and the other on management efforts for the conservation of Common Tern colonies in the lower Great Lakes.

A total of 450 Caspian Tern chicks were colour-banded in Lake Ontario to get a better idea of their winter quarters.

Songbirds

Forest bird research and surveys programs were extensive and ambitious, in parallel to the increasing national demand for integrated forest resource management. The major initiatives were as follows:

-CWS investigated, in cooperation with OMNR, bird communities and their habitat-use patterns in relation to forest types of northwestern Ontario. CWS conducted 700 bird surveys were conducted and classified 3500 Forest Evaluation Classification (FEC) plots in the 38 FEC types to examine the effectiveness of this new FEC avian use of the forest landscape.

In a parallel study, CWS and OMNR described the bird communities of old-growth pine forest around Temagami on 30 sites. The results will provide part of the basis for the long-term management plans needed to conserve the unique forest and wildlife natural heritage and sustainable timber supplies.

Forest birds are increasingly being identified as an environmental concern due to breeding habitat degradation and loss, and the destruction of neo-tropical forest winter habitat. Two major activities directed towards developing a more comprehensive system for monitoring forest birds were continued.

Following the completion of an extensive inventory of protected forest sites in southern Ontario, a project funded by C&P baseline studies and CWS A-base established and conducted initial bird surveys on 100 forest bird monitoring sites. Many of the sites will be surveyed on a continuing basis and all will provide locations suitable for further monitoring.

A volunteer-based Forest Bird Monitoring Program (FBMP) initiated as a pilot project in 1987 continued with 32 participants conducting 37 surveys.

Regulations and Enforcement

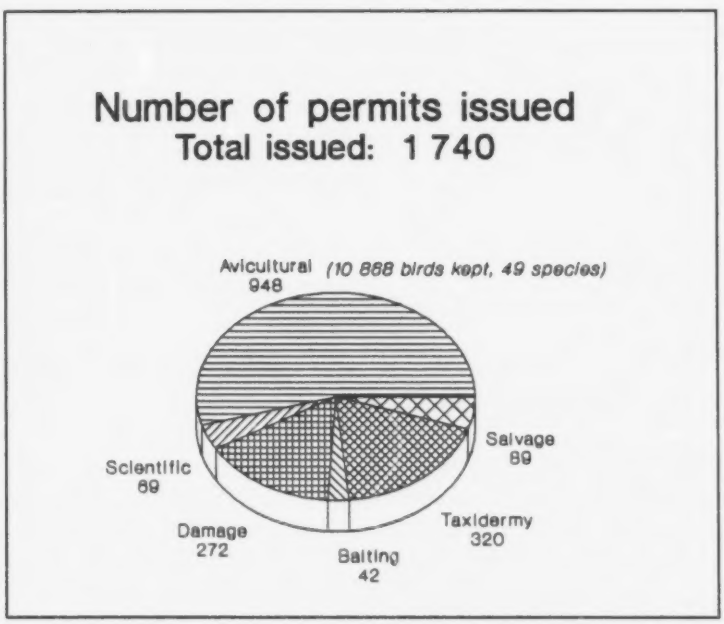
Three additional enforcement workshops were conducted for the training of RCMP on the enforcement of MBC Act and regulations. Some workshops were also attended by conservation officers and Conservation Authorities staff.

OMNR had a successful investigation of taxidermists, but RCMP inspections of aviculturists only take place when specific requests are made by CWS. New working relationships are being developed with the federal enforcement force, and full work planning is expected for the 1991-92 fiscal year, when CWS has its full strength of enforcement coordinators across Ontario.

Complaints about bird nuisance continue to increase with the following main activities:

- In southwestern Ontario, 152 damage permits were issued to protect crops and industrial sites from resident Canada Geese and Ring-billed Gulls. Some 16 permits were issued to golf courses.
- East and south of Ottawa, 52 spring damage permits were issued to keep some 250 000 Canada Geese from damaging alfalfa, clover, barley, winter wheat and other vulnerable crops in the fertile South Nation River area and other low lying farmland.
- Eight damage permits are also issued for Wolfe Island (where Lake Ontario meets the St. Lawrence River).

OMNR, RCMP, and CWS staff continued a special effort to contact the most affected farmers and increased patrols to ensure a smooth stay and passage of the geese through the corridor.



National Program 1.2
Wildlife Habitat

North American Waterfowl Management Plan Implementation

Work continued on habitat conservation under the EHJV and particularly on the First Step project at the Matchedash wildlife management area, a 2 157 ha wetland on Georgian Bay. Several hundred hectares of habitat were purchased using federal and provincial dollars with contributions from Ducks Unlimited and Wildlife Habitat Canada.

CWS-Ontario Region provided representatives to both the steering and technical committees that are developing a five-year joint venture habitat plan for Ontario. The plan will outline areas to be protected, conservation and maintenance options, and annual costs.

Habitat Conservation - National Wildlife Areas

The management of southern and eastern Ontario national wildlife areas (NWAs) continued according to approved management plans. Duck banding stations were operated at both Big Creek and St. Clair NWAs.

Long-term monitoring of the response of vegetation and breeding birds to water level manipulation continued in the Ducks Unlimited impoundments at Big Creek NWA.

At Long Point National Wildlife Area, CWS continued to collaborate with researchers from the Ontario Veterinary College (University of Guelph) in a study of the ecology of Lyme disease, a tick-borne disease of deer and small mammals which is infectious to people. Long Point is the only Ontario site where the Ixodes dammini tick has been found.

Also at Long Point NWA, a major program to reduce and control the chronic overpopulation of white-tailed deer was successfully initiated. A population of some 500 deer had prevented the regeneration of trees and growth of other vegetation. A series of controlled public hunts was organized by CWS and 405 deer were shot by hunters in October and November.

CWS check station data indicate a classic overpopulation situation, with animals at least one-third smaller than comparable southern Ontario deer. Check station data will provide a good basis for future management of the deer herd and the Long Point ecosystem.

A strategy to protect Wellers Bay NWA habitats from unauthorized public use was developed with input from Treasury Board, Public Works, and Department of National Defence for implementation in 1990-91. Extensive cooperative enforcement with the RCMP is being implemented.

Remedial action plans

CWS continued its commitment to the federal Environmental Assessment and Review Process (EARP) and the Great Lakes Environmental Quality Office through involvement with Remedial Action Plans under the Great Lakes Water Quality Agreement, the Environmental Assessment Coordinating Committee, International Joint Commission's Fluctuating Lakes Levels Study as it relates to wetlands, and reviews of general impacts on wetlands by development and agricultural practices.

National Program 1.3
Endangered Species

Recovery Status

CWS continued to monitor the success of the two Bald Eagle nests and several subadult birds on Long Point NWA. The Bald Eagle hacking project completed in 1987 has resulted in more numerous sightings of both immature and adult eagles in the Long Point area.

At Big Creek NWA, CWS cooperated with a local naturalist group, that erected Osprey nest platforms under a provincial Community Wildlife Interpretation Program (CWIP) grant.

Monitoring of Peregrine Falcon activities in the Ottawa area continues with the participation of Ottawa Field Naturalist Club birdwatchers. No nesting attempts were recorded although sightings of peregrines were reported in the city all year. At least two nests have been active again in the general area and the feasibility of fostering young in the Ottawa area is being examined in conjunction with the OMNR.

National Program 1.5
Regional Wildlife

Native Affairs

Discussions with the Nishnawbe-Aski Nation (Cree of northern Ontario) and the Ontario government, towards a conservation agreement for waterfowl of Hudson and James bays, broke off following a decision by the Cree that an internal review of the agreement's objectives was warranted.

Jointly with the Walpole Island Reserve, the drafting of a management plan for the Lake St. Clair marshes was begun with a view to completing a submission for RAMSAR designation in 1990.

National Wildlife Week

CWS Ontario Region participated with CWS Headquarters and other government and nongovernment organizations on various committees that organized a highly successful Wildlife Festival in the National Capital Region. An open house, including talks by staff, took place at the regional office in Ottawa and CWS displays were set up at shopping malls in Ottawa and London, and at the Metro Zoo in Toronto.

National Program 1.6
Natural Hazards

Goose Control

CWS continued to coordinate Canada Goose control on the Toronto waterfront and near the Upper Canada Migratory Bird Sanctuary in conjunction with OMNR staff. A total of 1073 adult geese were removed from the Toronto waterfront and donated to the State of Mississippi. Ministry districts of Blind River, Espanola, Nipigon, Atikokan, Sioux Lookout and Sudbury received approximately 400 goslings from the waterfront.

Approximately 600 Canada Goose eggs from the vicinity of the Upper Canada Migratory Bird Sanctuary were picked up by Oklahoma. In 1990 the goose roundup will be confined to Metro Toronto parks along the waterfront. However, eggs will be removed from property managed by the Town of Oakville. All adults and eggs will be donated to the State of Oklahoma.

Gull Control

CWS continues to advise landowners affected by Ring-billed Gulls nesting on their properties, and to monitor the effectiveness of operations to control several colonies. A new problem is caused by increasing numbers of gulls nesting on roofs, where they create noise, smell, and interfere with drainage systems. A manuscript *Roof-nesting by Herring Gulls and Ring-billed Gulls in Ontario in 1989* was submitted for publication in Ontario Birds.

National Program 3.2
Air / Water Emissions / Effluents

Acid Rain (LRTAP) / Wildlife Research

The LRTAP program was very active in 1989-90 with the continuation of three major studies, participation in international conferences, and analysis and write-up of data.

The biomonitoring program for waterfowl and their foods was continued in Algoma and Muskoka areas. Fish sampling was undertaken on 166 Algoma lakes in 1989, with a further 27 lakes to be sampled in 1990. Waterfowl surveys (indicated breeding pair and broods) were conducted on 232 wetlands in Muskoka. Results from the first two years show high numbers of insectivorous waterfowl at both Algoma and Muskoka sites. Water chemistry and fish data will be collected in Muskoka in 1990, and the food chain monitoring program will be initiated on 20 lakes in Algoma.

Algoma and Muskoka biomonitoring

Impacts on Common Loon

The third year of a study to measure impacts of acid precipitation on common loon reproductive success in Ontario was completed, using information obtained in the Ontario Lakes Loon Survey (OLLS) , a volunteer-based survey operated by Long Point Bird Observatory. In 1989, the OLLS recorded observations of loon reproductive success on 502 waterbodies in Ontario, with plans well underway to broaden the survey nationally. A status report on the effects of acid precipitation on Common Loon reproduction in Ontario was published.

LRTAP impact model

More progress was made towards the development and validation of a model of the effects of acid precipitation on waterfowl in eastern Canada. Work to date has concentrated on linking waterbird production to wetland acidity and other characteristics. Validation of the waterfowl model will be undertaken in 1990-91.

Further research was undertaken to examine factors affecting the productivity of cavity-nesting waterfowl in an acid-stressed area; in particular, the effects of wetland pH and fish status on female investment and attentiveness and on brood mobility and survival. These studies will be continued in 1990 and will provide important information as to whether or not acid-induced changes in the food webs of lakes can affect the reproductive performance of Common Goldeneyes and Hooded Mergansers.

A two-year study to examine macroinvertebrates in relation to acidity and fish status in 111 lakes in the two LRTAP study areas was completed. A paper entitled *Macroinvertebrate, fish, and waterfowl interactions in Sudbury area lakes* will be published in a Paper Series in the Canadian Journal of Fisheries and Aquatic Sciences.

National Program 3.3
Toxics

Great Lakes Water Quality and Pesticides

The Contaminants in Wildlife Program advanced on several fronts. The Great Lakes Herring Gull egg monitoring program entered its 16th year. Gull eggs were collected and analyzed from 14 sites. Results continue to show that levels of most contaminants have leveled off; several are showing small increases.

CWS also collected and analyzed eggs of Double-Crested Cormorants and Black-crowned Night-Herons from 6 colonies each. These collections were part of a resampling sequence which occurs every 4-5 years for these species; most levels have decreased since the last sampling.

Extensive sampling of gulls, terns and cormorants was done at the Hamilton Harbour Remidial Action Plan (RAP) site for examination of contaminant-related biochemical markers. Detailed monitoring was done at a new Common Tern Colony unexpectedly appeared at the Windermere Basin dredging construction site, altering the construction schedule for six weeks.

Population monitoring was done on all 66 cormorant colonies on the Canadian side of the Great Lakes. Population levels continue to increase. Studies by fisheries biologists suggest alewife stocks are extremely stressed and may crash soon. This could have a dramatic effect on cormorant populations; continued monitoring is planned. More than 20 000 young cormorants were examined for abnormalities in the Great Lakes and Lake Winnipegosis; deformity rates were lower than in 1988.

The second year of a three-year study of potential contaminant effects upon bluebirds and swallows in 24 southern Ontario apple orchards was completed. Approximately 200 samples were taken for analysis of cholinesterase depression. Both young and adult Tree Swallows were affected. Reproductive success was reduced by approximately 25-30%.

Approximately 400 kestrel nest boxes were examined in the area from Niagara-on-the-Lake to St. Thomas. Although production from successful boxes was good, more than 50% of the boxes in heavily sprayed areas showed early abandonment.

Collections of snapping turtle eggs were made at 12 shoreline wetlands in Lake Erie, Lake Ontario, St. Lawrence and Ottawa River and Algonquin Park in 1989. Eggs were analyzed for organochlorine contaminants and will soon be analyzed for dioxin and furan levels. PCBs and organochlorine pesticides were highest in eggs collected from Lake Ontario, and at a site close to Lake Ontario but on the St. Lawrence River. Contaminant levels in snapping turtle eggs do not appear to have declined when compared to an earlier collection made in 1984. Hatchery success and incidence of deformities were determined in artificially incubated eggs from locations. Incidence of deformity was highest and hatchery success lowest in the Lake Ontario population relative to sites in Lake Erie and Algonquin Park.

Lead Poisoning

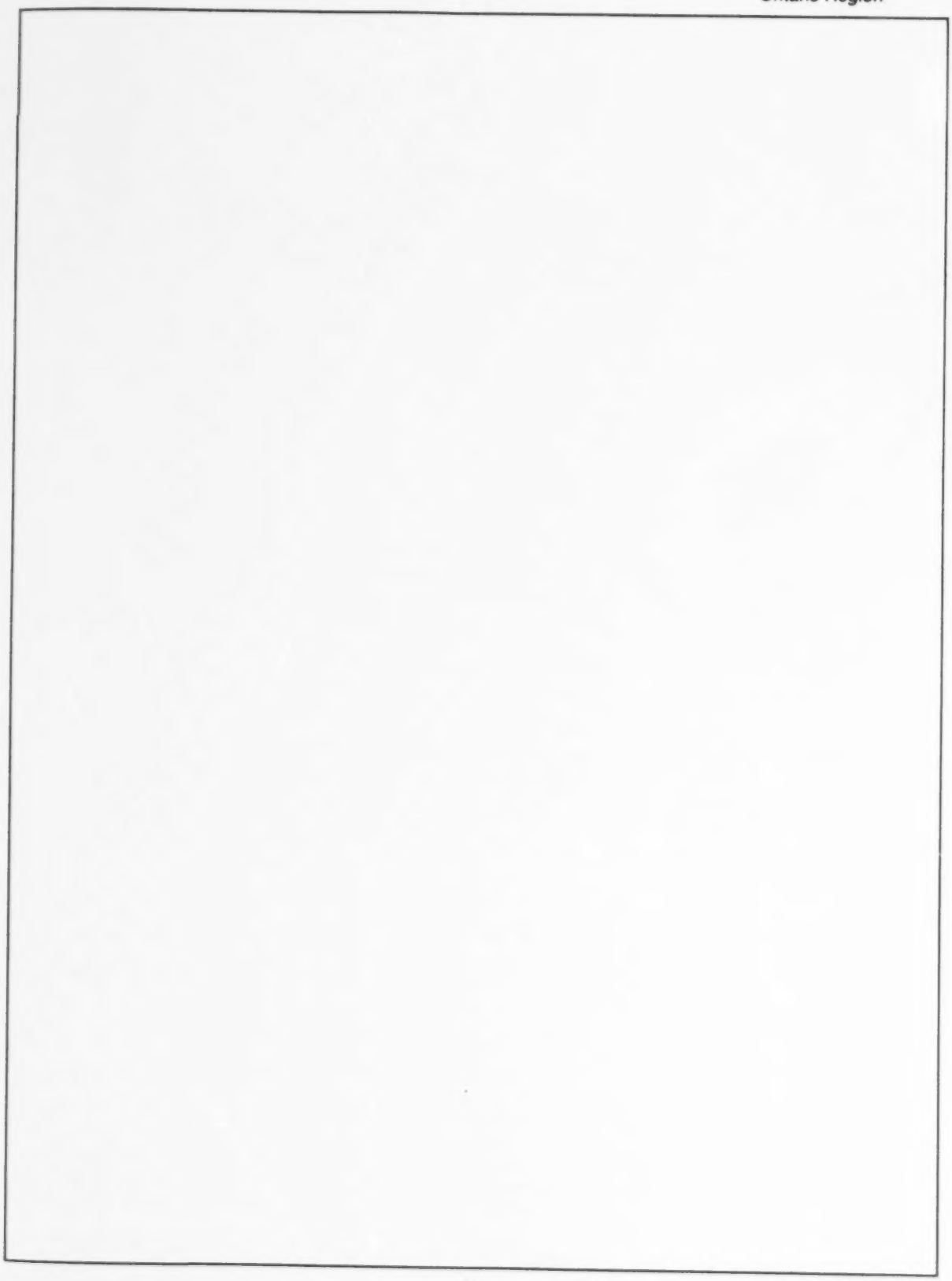
As a result of recent losses of waterfowl at Lake St. Clair to lead poisoning, portions of Kent and Essex counties near the lake will be zoned for nontoxic shot beginning with the 1990 hunting season. Pathology work conducted on incapacitated birds collected near the end of the 1989 hunting season showed that 71.4% were incapacitated by lead poisoning, whereas only 11.4% were incapacitated as a result of gunshot wounds. Gizzards were collected from additional areas in Ontario in the 1989 hunting season, but analysis has not been completed at present.

National Program 3.4
Spill and Waste Sites

Oil Spill Response Strategy

Areas with large concentrations of migratory birds most likely threatened by potential oil spills in Ontario were identified and CWS response requirements defined. With help from the Canadian Coast Guard, basic equipment and supplies for scaring, rescue and rehabilitation activities were purchased and stockpiled in locations in eastern Lake Ontario and Welland Canal area, and in two mobile units (southwestern Ontario and Ottawa).

A network of government and nongovernment resource contacts is being developed and a listing established for easy access during an emergency.



Chapter 8

Western And Northern Region

Regional Overview

Declines in duck populations, in particular, Mallard and Pintail, have caused significantly increased concern about harvest levels and have prompted negotiation of a long-term harvest strategy. The implementation of the Prairie Habitat Joint Venture involves actions to conserve habitat for waterfowl and other wildlife, and it is hoped that, as a result, populations will increase over the long term. The North American Waterfowl Management Plan Arctic Goose Joint Venture is slowly progressing toward implementation.

The federal Environmental Assessment Review Process and associated court decisions have started to significantly change the way that governments, generally, do business. This change in role has significant implications for program delivery and planning. Activities of note this past year involved dams (Rafferty-Alameda), pulp mills (ALPAC), and diseased wood bison. These kinds of activities are continuing in 1990-91.

Significant milestones in various endangered species recovery programs (see detail below) included the seventh year of increase in Whooping Crane populations, the startup of activities involving woodland caribou and peary caribou and a new release strategy for swift fox. Major surveys of Peregrine Falcon and Trumpeter Swans are proposed for 1990.

Management of the wood bison recovery plan could be significantly influenced by the results of the wood bison disease panel.

The impact of climate change on habits already under pressure from industrial developments could further complicate the management of wildlife populations. There is a greater need to understand and manage ecosystems. The focus of research will be shifting to ecosystem management and impact assessment.

National Program 1.1
Migratory Birds

Monitoring of Panamerican Migrant Birds

In order to assess the possible impact of forest clearance in the American Tropics on the birds migrating between the Tropics and the Prairie Provinces, a program to monitor population trends and related life-history aspects of this shared avifauna was initiated in Prairie Provinces in 1989. The program included the establishment and census of breeding bird monitoring plots, banding of fall migrant birds, and the inspection of television towers for bird casualties.

Twenty plots located in six different forest habitats were surveyed at least once, yielding a total of 2387 birds of 105 species. Over 60% of the birds and 36% of the species were long-distance or Panamerican migrant birds. Preliminary data suggest that mixed wood forests are richest in long-distance migrant species, whereas aspen forests are richest in long-distance migrant individuals.

Mist-netting yielded a total of 239 birds of 34 species; 59% of the birds and 56% percent of the species were Panamerican migrants. Catch per unit effort (969 birds/1000 net-hours) compared favorably to published results for several banding stations.

Three television towers yielded 254 birds of 26 species; 93% of the birds and 73% of the species were Panamerican migrants. The five Swainson's Thrushes present in this sample were the only ones of their kind to be collected since 1974 at towers near Saskatoon and Regina, before 1974 this species was the fourth most commonly collected species at television towers.

Arctic Goose Research

The ecology of geese staging in spring is being investigated in southern Manitoba. This is an important area used by hundreds of thousands of Lesser Snow Geese and other migratory birds moving north each spring to nest in the Arctic. In the case of Lesser Snow Geese, it is the most northerly source of cultivated crops; these geese rely on this food for energy and nutrient reserves in order to survive and reproduce in the Arctic. This study is designed to examine what (agriculture, weather) affects the distribution of geese, and to study other factors that affect the accumulation of nutrient reserves each spring.

Arctic Goose Joint Venture Prospectus

Unknown breeding distributions of Arctic-nesting geese, recent changes in their number and winter distribution, alteration of ranges, and population mixing are among the issues that require immediate attention for effective population management. This prospectus outlines the issues facing arctic geese today, and calls for greater attention of these issues by both Canada and the United States. The Arctic Goose Joint Venture, under the North American Waterfowl Management Plan, will integrate and facilitate arctic goose research and monitoring.

Rangeland Management

In the aspen forest, cleared rangelands associated with wetland habitat are promising as waterfowl nesting areas if they are managed to maintain some diversity of vegetation. In cooperation with the Prairie Farm Rehabilitation Administration (PFRA), CWS is studying the effects of brush removal and vegetation succession on the densities, distribution, and success rates of nesting waterfowl on improved PFRA pastures. Surveys continued in 1989 to document duck populations, nesting densities, and brood production on two range cover types. The nest site preferences of ducks were evaluated by comparing vegetation at nest sites with that of the surrounding rangelands. The study will provide guidelines for managing converted rangelands to ensure compatible benefits for both livestock and waterfowl.

Waterfowl Nesting Habitat

The CWS and Saskatchewan Parks and Renewable Resources (SPRR) cooperated in the Prairie Pothole Project which was also supported by Wildlife Habitat Canada. The project is designed to protect and enhance nesting habitat and thus promote net increases in waterfowl production. Through lease agreements with prairie farmers in the municipality of Antler, SPRR protected and improved parcels of upland nesting cover and wetlands. CWS and SPRR are evaluating whether habitat losses are being offset and duck numbers are being increased for the 5-year period ending in 1991. Through annual surveys, both agencies are documenting and comparing habitat changes and the response of duck populations on experimental and neighboring untreated areas, to determine the value of enhance nesting habitats, such as seeded dense nesting cover plots, native

grasslands and nesting structures. Improvements in duck production are expected when the current drought ends. Annual reports are available for 1987, 1988 and 1989.

Climate Change

Together with National Hydrology Research Institute and Ducks Unlimited Canada, CWS is helping to support a study of wetland hydrology and climate change at the St. Denis NWA, conducted by Dr. H. Woo, McMaster University.

A preliminary bibliography of climate change and wildlife was circulated throughout the CWS for comment, and is now being reformatted and revised. The report of the 1989 Workshop on Wildlife and Climate Change has been completed and will be circulated early in the 1990-91 fiscal year.

CWS carried out field work on breeding phenology of landbirds in relation to climate at St. Denis National Wildlife Area involving both the recording of songs on transects and the recording of breeding and moulting condition of birds subsequently banded. Staff handled over 270 birds between mid-May and early September; they caught four species - Warbling Vireo, Yellow Warbler, House Wren, Clay-colored Sparrow - frequently enough to justify their use as monitors of breeding phenology, and in 1990 CWS will provide nest-boxes and hope to add a fifth species - Tree Swallow, to that list.

A paper on 'Wildlife as biological indicators for assessing impact of climate change' was prepared for delivery at an international Symposium/Workshop on *Climate change: implications for water and ecological resources* held at the Water Institute, University of Waterloo, and subsequent publication in the journal Climatic Change.

Dabbling Ducks

Studies of homing, nest-site selection, fall-residency patterns, and population regulation in upland-nesting dabbling ducks continued at the St. Denis National Wildlife Area, Saskatchewan, in 1989. The study is yielding valuable information that is helping us to understand how changes in nesting habitat quality, and wetland and predator numbers, affect breeding success of ducks.

Some results of these studies have been summarized and, submitted to, or published in journals. Complementary studies of breeding biology of Mallard and Blue-winged Teal, and of American Crows, are continuing in cooperation with graduate students at the University of Saskatchewan. A study of survival of Mallard and Blue-winged Teal hens and their broods, supported by the North American Waterfowl Management Plan, will begin in 1990.

Biometrical Support

We used the SPANS geographic information system was used extensively this year, for projects including modeling of energetic demand contours for North Atlantic seabirds, northern breeding distribution of snow geese, and relationships of snow geese to corn field distribution in Manitoba. We extended computing support for field projects was extended through the purchase of several laptops, and office support by linking most computing equipment through a serial network, providing wide access to software. The section implemented a more rational and streamlined process for regional informatics planning and provided support for statistical and computing aspects of most projects.

Waterfowl Population Regulation

Cooperative Mallard banding programs indicate that band recovery rates (index of kill rate) decreased between the 1979-84 period and the restrictive period 1985-88. Mean survival rates for the 3-year period 1985-87 increased for adult males and immature males and females, while those for adult females increased but not significantly.

Waterfowl Populations - NWT

With worsening habitat conditions on the prairies, the boreal forest is becoming increasingly important to the well-being of North American waterfowl populations. Although significant numbers of ducks attempt to breed in the boreal forest each year, the status and productivity of these populations are poorly understood. In 1985, CWS initiated a study of the productivity of duck populations in the boreal forest to document population levels, productivity, habitat, and factors limiting reproductive success of boreal ducks. A progress report summarizing field work undertaken from 1985 to 1989 will be completed in March 1990.

Greater White-fronted Geese are important to subsistence hunters in the Inuvialuit Settlement Region as well as to recreational hunters and naturalists further south, but the status of the white-fronted goose population that breeds in the western Arctic is uncertain. This ongoing study, supported by the Inuvialuit, will provide basic information on the population size, distribution, and habitat of white-fronted geese in the settlement region. It will also provide useful data on the status of Tundra Swans. CWS conducted preliminary surveys in 1988 to develop census techniques, and, in 1989, biologists estimated the numbers of white-fronted geese and Tundra Swans present in a 13 600 km study area through helicopter surveys. Population estimates for the study area were 34 442 + 3979 (standard error) for white-fronted geese and 13 546 + 1334 for tundra swans. At least 18% of the mid-continent population of white-fronted geese, and 15% of the eastern population of Tundra Swans occurred on the study area. The surveys will be expanded in the future to cover the entire breeding range of white-fronted geese in the settlement region.

CWS carried out a survey of moulting Canada Geese was carried out along the Snowdrift and Thelon rivers and published results in a technical report. This three-year project will be completed in 1990. It was initiated in response to Indian and Northern Affairs Canada's northern minerals policy, which called for a review of the wildlife resources within the Thelon Wildlife Sanctuary.

For a fourth consecutive year, biologists carried out waterfowl surveys were carried out in the North Arm of Great Slave Lake, including aerial surveys of spring staging sites and boat surveys of broods and moulting concentrations. Results will be available in a technical report to be completed in 1990.

For a fourth consecutive year, CWS censused the population of breeding larids in Great Slave Lake, documenting over 50 new breeding sites, comprising 2500 pairs and representing nine larid species, and identifying a new key habitat site, supporting the largest known colony of Caspian Terns in the N.W.T.

Waterfowl Populations - Prairies

Persistent drought on the Canadian Prairies continued to severely hurt waterfowl during 1989. May breeding population surveys showed a 20% reduction in available ponds in 1989, on top of a 35% reduction between 1987 and 1988. The 1989 estimates of numbers of Mallards and total ducks reached a record low value in 1989 for the second consecutive year. There was minimal overflight to northern areas. However, Mallard and total duck numbers in Western and Northern Region were down by 14% and 9%, respectively. Aerial surveys in July confirmed expectations that waterfowl production in Prairie Canada was again very poor in 1989.

Habitat monitoring during the breeding ground survey indicated that the quality and quantity of waterfowl breeding habitat are not improving. Reduced numbers of ponds were available for breeding ducks in 1989, and 22% of the basins and 78% of the margins were affected by some type of agricultural activity.

To monitor the recovery and survival rates of Mallards in the Canadian Prairies, CWS, in cooperation with the Fish and Wildlife Service, maintained 16 banding stations in 1989. Although duck numbers were low, an intensive effort by field personnel resulted in the banding of approximately 35 000 Mallards and over 25 000 ducks of other species.

A pilot program to neck collar and leg band small Canada Geese on the Great Plain of the Koukdjuak was initiated in 1989. The banding along the west coastline of Hudson Bay was continued. Neck collaring of Ross' and Snow geese was completed in the Queen Maud Gulf colonies in the central Arctic and western Arctic. Observation of these neck banded geese in prairie Canada and the U.S. in 1989 increased substantially over 1988. An expanded observation network by the CWS and cooperating agencies, is gathering information on changes in migration patterns and use of wintering areas. CWS staff continued to coordinate and conduct neck band observations of Ross' and Snow geese in Mexico in 1990 resulting in nearly twice the observations obtained the previous year.

In addition, an observation network was established to record collars on white-fronted geese on the migration areas in prairie Canada and wintering areas in the United States.

In 1989, CWS used additional LANDSAT imagery to examine habitat degradation on the McConnell River snow goose colonies. We were able to detect known areas of habitat destruction observed during ground studies, plus varying levels of damage.

Passerine and Larid Surveys

The Willow Flats mist-netting/bird-banding project was active for a fifth consecutive year. Project staff completed a study of the spring migration of passerines at Yellowknife: they will publish their results in 1990.

Latin American Program Studies

CWS staff participated in the second year of a pilot study of wintering forest birds in the Zapata Swamp, Cuba, with assistance from the Long Point Bird Observatory and three Cuban agencies.

National Program 1.2
Wildlife Habitat

Shorebirds

Aerial and ground surveys in the past three field seasons have confirmed a number of significant shorebird staging areas in prairie Canada. There are two sites of hemispheric reserve quality and at least 13 of regional reserve quality in prairie Canada, according to definitions of the Western Hemispheric Reserve Network for Shorebird Conservation. The continuing drought in Saskatchewan considerably hampered the Quill Lakes, Saskatchewan, banding program in 1989, but biologists banded another 400 shorebirds, bringing the total for the last two years to 1900, and recovered four bands during sightings of banded shorebirds, thus helping to identify migratory routes. CWS collected benthic samples were collected from the Quill Lakes area, as an initial part of a study identifying shorebird food and habitat requirements in prairie Canada. The staff assisted with a Congressional tour of the Quill Lakes project area in August 1989.

Areas of importance and management plans

A management plan was completed for Polar Bear Pass National Wildlife Area, Bathurst Island, N.W.T., following extensive consultations with the Area Advisory Committee and other interested parties. The advisory committee comprises representatives from Indian and Northern Affairs Canada, Fisheries and Oceans Canada, National Museum of Natural Sciences, the Resolute Hunters' and Trappers' Association, and the N.W.T. Department of Renewable Resources.

Sanctuaries

A revised edition of *Key Migratory Bird Terrestrial Habitat Sites in the Northwest Territories* is nearing completion. The report describes 80 sites of major importance to migratory birds in the N.W.T., an increase of 20 sites since the first edition was printed in 1984.

Public consultations regarding the establishment of Prince Leopold Island as a migratory bird sanctuary were completed in 1989. The proposal received wide support and designation is scheduled for the 1990-91 fiscal year. Prince Leopold Island will be the 17th migratory bird sanctuary in the N.W.T. and the first to be established there since 1975.

CWS staff completed a review of all Migratory Bird Sanctuaries in the N.W.T in response to Indian and Northern Affairs Canada's northern minerals policy. According to the policy, a review of sanctuary boundaries was needed to ensure that the lands contained therein are necessary to achieve the conservation objectives for which the sanctuaries were established. Results of the review indicate that five sanctuaries (Dewey Sober, East Bay, Harry Gibbons, Kendall Island, and McConnell River) require expansion in order to protect their key migratory bird habitats.

CWS Information brochures for three Migratory bird sanctuaries in the N.W.T.: Bylot Island, Dewer Soper, and Seymour Island.

National Program 1.3
Endangered Species

Whooping Cranes

CWS maintained a 24-hour system for the public, conservation officers, and NGOs to report sightings of Whooping Cranes from April to December 1989. Habitat-use data were collected during the spring and fall migration. Five non-breeding Whooping Cranes summered in Saskatchewan during 1989. CWS distributed summaries of 1989 sightings of Whooping Cranes during spring and fall migration to cooperators and NGOs.

Loggerhead Shrikes

Biologists continued field studies of Loggerhead Shrike productivity in relation to habitat conditions in Alberta, Saskatchewan, and Manitoba. Cooperating agencies included the Saskatchewan Natural History Society, the World Wildlife Fund, and the Manitoba Department of Natural Resources. Initial results suggest that productivity is substantially better in native prairie than in agricultural habitats in Saskatchewan.

Whooping Crane Ecology and Rehabilitation

As part of the continuing efforts to conserve the endangered Whooping Crane, CWS carried out aerial surveys in 1989 to monitor cranes and their nests in and near Wood Buffalo National Park (WBNP). We know that at least 31 nests were constructed in 1989. Two pairs of cranes failed to nest in 1989, although they did so in previous years.

Of the seven live surplus eggs that CWS shipped to the Patuxent Wildlife Research Centre in Maryland for captive rearing, six eggs hatched and three young survived. No eggs were shipped to Grays Lake, Idaho, and that foster rearing program is being phased out.

As practically all objectives of the color banding program in WBNP have been reached, color banding ceased in 1989.

Three Whooping Cranes are now missing from the 146 birds arriving at the Aransas National Wildlife Reserve on the Texas coast. The past year marks the seventh consecutive year of population increase in the WBNP flock.

As of March 1, 1990, the world population of Whooping Cranes is about 204 birds, including 49 birds in captivity, 14 in the Idaho-New Mexico flock and about 143 in the WBNP-Texas flock.

Woodland Caribou

Woodland caribou and their habitats are being studied in the Athabasca River drainage within Jasper National Park. A major study, which highlights movement patterns and mortality patterns using radio-collared caribou, is being headed by a team of consultants. The CWS component is focusing on the adequacy of the winter range and the influence of successional changes, weather, location of summer range, and other factors on use of winter habitats by caribou. The study, started in October 1988, indicates that predators are a major limiting factor in the park.

A large prey base is present and roads and trails provide easy access to caribou winter range for wolves. The study is designed to last for 3 - 5 years.

Trumpeter Swans

CWS collared and banded 28 adult Trumpeter Swans from the Southern MacKenzie District, N.W.T., were collared and banded in July 1989, for a total of 100 adults and 56 cygnets marked since 1986. Cooperating U.S. biologists and the general public have provided over 200 observations of marked Trumpeter Swans. N.W.T. trumpeters have been observed wintering in the Yellowstone and Grand Teton national parks; Red Rocks Lake National Wildlife Refuge, Harriman State Park, Chico California and Ash Meadows, Nevada with major concentrations on the Teton River, Idaho. More than 20 observations of red collared trumpeters have been received from locations around Waterton Lakes National Park, Olds, Calgary, and the Grande Prairie area (Alberta) and Brazeau Reservoir and Fort St. John, (B.C.) during spring and fall migrations.

The 1989 aerial surveys indicated a 60% increase in brood production and a 46% increase in total cygnets produced as compared to 1988. Total July population was 118 birds, which compares favourably to the four year mean for this flock. Harsh weather conditions on the wintering grounds may have had an impact on some of the adults and a large segment of the subadults, as total number of adults was 9% lower than in 1988. Blood samples were collected and will be submitted for baseline blood data and blood parasite analysis in cooperation with Camrose Veterinary Clinic and Memorial University in Newfoundland.

On August 28 and 29, 1989, biologists captured, banded and measured and took blood samples of 33 Cygnets. Some of the broods had cygnets that were exceptionally small in size and so they were not "wing marked" as planned. In all, 19 cygnets were marked on each wing with a black-and-yellow marker. Trumpeter adults and cygnets sampled for blood parasites were found to be infected with Haemoproteus, Leucocytozoon, and Plasmodium. Blood samples collected for baseline information are still being analyzed.

We plan to survey Trumpeter Swans throughout the N.W.T. in 1990.

Wood Bison Recovery Program

The CWS is coordinating a cooperative national program to reintroduce free-roaming populations of wood bison in areas of historic range in northwestern Canada. Wild herds have been established in the MacKenzie Bison Sanctuary and in the Nahanni-Liard river valleys in the N.W.T. Release to the wild occurred in 1988 and 1989 in the Yukon and will continue annually in an effort to establish a free-roaming herd of 200 by 1994.

The Hay-Zama project in northwestern Alberta has experienced several setbacks.

Culling of adult males during the winters of 1988-89 and 1989-90 has reduced the captive herd to 21 animals. The potential for disease contamination of free-roaming wood bison in northwestern Alberta has resulted in an indefinite postponement of a release. The need to re-evaluate the project in terms of the northern diseased bison issue is being discussed by the Alberta Fish and Wildlife Division, the Dené Tha Band, and the CWS.

The transfer of 12 wood bison to Nahanni Butte in March 1989 from a zoo in southern Saskatchewan increased the wild herd to about 50 animals. However, recent problems with those animals in and around the village may necessitate their removal from the area. Further supplements await the outcome of this situation. Negotiations are presently underway with the government of the N.W.T. for placement of approximately 60 surplus wood bison from Elk Island National Park.

Peary Caribou

The CWS initiated an ecological study of Peary caribou on the south-central Queen Elizabeth Islands of the Canadian arctic archipelago, with an emphasis on springtime foraging strategies of Peary caribou in relation to their physical environment. The study area is termed the "Bathurst Island complex" and includes a complex of 26 islands lying between 74 and 77 latitude and 93 and 107W longitude with a collective landmass of ca. 27 000 km2.

Field workers established permanent base camp on northeastern Bathurst Island and laid out about 10 km of snow course transects on the primary study area.

A systematic unbounded line transect-type aerial survey, carried out in July on the five western major satellite islands (Alexander, Marc, Massey, Vanier, and Cameron), resulted in sightings of 213 caribou and thirteen caribou: most (54.9%) on Massey Island, followed by 24.4% on Ile Vanier, and 226 + 45.3 (SE) were estimated. Representation of calves was high at 31.5% of all caribou seen.

CWS staff also conducted nonsystematic aerial searches by Bell-206B helicopter during June and July 1989: they were able to segregate 491 caribou by sex and 512 by age class. The proportion of calves was 25.5% in June and dropped to 23.6% in July. Calves were associated with 74.1% of the 1+ year-old caribou seen in mixed sex/age groups in June and 63.9% in July 1989, indicating that early mortality of calves had been low in 1989. Initial calf production in 1989 was high, with apparently about 90% of the breeding females giving birth.

CWS produced a status report on the Peary caribou Status Report and submitted it to the Committee On The Status Of Endangered Wildlife In Canada for its consideration.

Piping Plovers

For the first time in prairie Canada, biologists carried out population and production surveys for Piping plovers in different provinces during relatively standardized time periods. As part of this effort, CWS surveyed seven lakes in Alberta and monitored nesting effort more intensively at three of these lakes. CWS searched for Piping Plovers in Cuba, through the CWS Latin American Program and with the cooperation of the Cuban Academy of Sciences.

CWS published a Hinterland Who's Who on the Piping Plover in fall 1989 to provide Canadians with general information on this species.

The Prairie Piping Plover Recovery Team held its second meeting in fall 1989, and all four North American Piping Plover recovery teams were represented at a joint meeting in Florida during February 1990.

Planning is underway for an international survey of Piping Plovers on wintering and breeding habitat to be done by various agencies during 1991.

Swift Fox

The recovery team began to coordinate of the swift fox research and management project in April 1989. In the first year, the team held six meetings. The Swift Fox Propagation Committee coordinated the captive breeding.

In 1989, 97 foxes were released. This brings the total number of released foxes to about 310. A new release site (Knight/McIntyre Ranch) was chosen in Alberta. This area is closer to the mountains and at higher elevations, thus there is more moisture there than at the previously chosen release sites.

In 1989, a new release strategy was employed. Foxes, which had been held captive over the winter, were released in May directly into the prairies. This technique will again be used in 1990, and, as well as captive raised foxes, wild foxes will be released. The wild foxes are part of a group of 19 that were live-trapped in the U.S.

Anatum Peregrine Falcon Recovery

In 1989, the Wainwright Captive Breeding Facility produced 105 young for release at 12 sites in southern Canada. The peregrines are fed captive-raised quail at the rate of 60 000 per year. The number of wild Peregrine Falcons in southern Canada east of the Rockies increased to 28 territorial pairs, plus an estimated 26 pairs on the coast of Labrador, and at least 10 other single peregrines. These falcons have re-occupied areas of Canada because of the captive breeding of falcons and their release in cities and from cliffs.

The Peregrine Falcon Recovery Team met in October in Toronto, Ontario and recommended that a major survey for peregrines be conducted in 1990 to compare with surveys held every five years since 1970.

National Program 1.4
International Water and Wildlife Resources

Polar Bear Ecology

The Polar Bear Technical and Administrative committees continued to coordinate polar bear research and management activities through the year.

Technical assistance and information were provided to the Inuvialuit Game Council as they negotiated a management agreement with the Inupiat of the North Slope Borough (Alaska) for the management of polar bears in the southern Beaufort Sea. The Agreement itself was signed in January and in November, the technical committee met for the first time. A quota of 76, to be shared equally between Canada and Alaska, was agreed upon. Females with cubs and bears in dens are to be protected and there should be an attempt to shift the hunting kill onto males whenever practical.

Entry of capture and kill data from CWS, N.W.T. and Manitoba into the National Polar Bear Data Bank continued through the year with the total number in the files now at about 22 000. These files provide the data base for extensive reviews of kill patterns and research topics that require long runs of baseline data. Data are available for all Canadian Polar Bear Management Zones.

In fall 1989, 302 polar bears were captured as part of a study of the age and sex-specific survival rates of polar bears and of the fidelity of adult females and female young to maternity denning areas. On average, bears were lighter than normal and we predicted this would result in an increased number of polar bears around the Churchill area, which later proved to be the case. In the spring, 23 adult females, including two lone females, and 48 cubs-of-the-year were tagged as well.

Observations of walruses, polar bears, and the Dundas Polynya continued from mid-February to the middle of May. Four of the nine walruses branded there in the last two years were resighted. Bears were abundant in the area during the observation period. Over the past 10 years, there has been a steady increase in the size of the polynya in the spring, which might be a result of climatic change. This is causing some shifts in the distribution and possibly the abundance of polar bears and marine mammals using the area.

National Program 1.5
National / Regional Water and Wildlife Resources

Migratory Bird / Agriculture Interactions

A report for the migratory bird/agriculture interaction project is now in preparation. This report suggests what research is needed on the interaction between migratory birds and agriculture in Western and Northern Region.

Along 281 km of transect within 10 selected townships in southwestern Saskatchewan between June 6 and 24, 1989, observers counted 54 indicated breeding pairs of Long-billed Curlews and 5 broods, compared to 36 indicated pairs and 2 broods on the same routes for the same time period in 1988. This response may be attributable in part to improved moisture conditions in May 1989 that resulted in excellent production of vegetation and insects for the additional curlews to prey on.

Wetland Margin Study

The wetland margin study will proceed, with funding coming from Ducks Unlimited Canada and the Prairie Habitat Joint Venture. Field surveys will be initiated in May 1990 and dense nest cover seeded near Minnedosa, Manitoba by November 1990. Field sites were surveyed and selected in 1989, and a cooperative agreement developed with Ducks Unlimited Canada.

Integration of migratory bird and timber management

A study of migratory songbirds in boreal forests began with problem evaluation, establishment of contacts with Forestry Canada and and the preparation of an extensive bibliography of the impact of forest management on migratory songbirds.

Northern Land Claims

CWS staff participated on the Inuvialuit Wildlife Management Advisory Committee and the Nunavut Wildlife Management Advisory Board.

Beverly-Kaminuriak Caribou Management Board

The CWS, representing Environment Canada, participated in board meetings at Baker Lake, Lac Brochet, and Winnipeg. The primary issues in 1989 were the proposed Kiggavik mine, commercial quotas, the Thelon Game Sanctuary, northern broadcasts on caribou management, "Border A" licenses for provincial users who trap and hunt caribou in the N.W.T., the effect of low-level military flights on caribou, and incorporation of burn history maps into a Geographical Information System.

Wolf Ecology

Field studies on wolf predation on bison calves were carried out from May to mid June and again during October in Wood Buffalo National Park. There was evidence of increased losses of calves to wolf predation.

Predator/prey studies within and adjacent to Riding Mountain National Park continued. Evidence of wolf predation on coyotes suggests that the interactions between these two species are ecologicallly important. Serum samples from both species indicated no transfer of coyote genes to wolves in this area. This situation differs from the examination of similar samples elsewhere in North America.

National Program 3.3
Toxics

Lead Shot Poisoning in Waterfowl

Monitoring of spent lead shot continued in prairie Canada and significant levels of lead were found in the Oak Hammock Marsh area. Preliminary estimates of goose mortality associated with lead range from 2000 to 5000 geese annually. A draft policy on the use of lead in Canada was developed with regional input, and recommendations for alleviating lead poisoning were presented to each province.

Toxic Substances

The effects of carbofuran-sprayed vegetation on Mallard ducklings was examined by walking 1-day-old ducklings through sprayed vegetation for up to 300 metres and subsequently testing for behavioural changes and brain cholinesterase depression. Signs of poisoning were evident, so this project will continue in 1990-91 to determine effects of carbofuran on survival of broods in ponds. The bluebird trails project continued for a second year as a pilot project to monitor effects of pesticides. CWS provided six trail operators with notebooks to use for one nesting season, in order to detect potential problems in collecting data. Growers of seed alfalfa in Saskatchewan and Manitoba were interviewed about pesticide use to determine potential hazards to wildlife inhabiting alfalfa fields. A project to compare use of habitat by birds on organic and conventional farms was initiated by the selection and habitat mapping of 10 pairs of farms of these types in Saskatchewan.

Chapter 9

Pacific and Yukon Region

Regional Overview

Pacific and Yukon Region hosts the largest diversity of habitats and migratory birds in the country. The region is also the site of a rapidly expanding Pacific Rim economy and home to a large and vocal conservation community. Because of this, CWS plays a high profile role in a variety of issues including waterfowl research and management, marine bird research and conservation, old growth forest ecology, urban encroachment on habitat, oil spill response, toxic chemicals, international wildlife, and Porcupine Caribou Herd conservation. The 25 sample projects described in the program activity portion of this report reflect the diversity and profile of the work undertaken in 1989-90.

National Program1.1
Migratory Birds

Regulations and Enforcement Section

The Regulations and Enforcement Section staff increased by two person years. The opening of an office in Prince George has given the Regulations and Enforcement Section the ability to maintain better liaison with the RCMP, B.C. conservation officers, Department of Fisheries and Oceans (DFO), and the Yukon Game Branch in the northern part of the region. Part of the liaison took the form of cooperative patrols, assistance at road blocks, and providing training.

Regulations and Enforcement Section staff tried new initiatives this year, involved the use of media to increase awareness of enforcement problems.

The first involved the use of a local newspaper reporter on late hunter patrols. An article appeared highlighting the problems caused by late hunters. The second involved a local TV station that produced a week long series called "Unfair Game". This program discussed poaching and highlighted the "Observe, Record, and Report Program".

Regulations and Enforcement personnel participated in Police Week displays in Prince George. The displays were set up in the local mall and were well received. Our display highlighted the new CWS enforcement office in that city.

Regulations and Enforcement personnel have maintained a high profile in the region and as a result hunter compliance and awareness has improved. Enforcement will be concentrated on known problem priority areas and long term multiple offenders.

Regulations and Enforcement are preparing training programs for RCMP, B.C. conservation officer Service and Federal fisheries officers in identifying priority areas for migratory bird enforcement. Enforcement staff is also preparing a CITES training program for new CWS enforcement staff, RCMP Customs and Excise Section and Canada Customs. The CITES course is intended to familiarize personnel with CITES problems in this region, provide a general awareness of CITES requirements and provide front line inspectors with some identification skills.

Waterfowl Management

CWS biologists conducted waterfowl pair surveys in the grasslands of the southern interior of B.C., in cooperation with Ducks Unlimited Canada and the B.C. Wildlife Branch. Waterfowl populations continued a downward trend in parallel with recent low winter snowfall and reduced run-off into breeding ponds. They also conducted qualitative habitat survey of the ponds used for the pair survey, to determine what factors had important impacts on waterfowl habitat. More than half the ponds surveyed were adversely affected by heavy grazing pressure from cattle.

CWS conducted Annual Canada Goose surveys in the Fraser Valley and on southern Vancouver Island. Management strategies for problem concentrations of urban geese were developed, in cooperation with the B.C. Wildlife Branch and various municipalities affected by goose concentrations.

A triennial survey of waterfowl wintering on the Fraser River delta was conducted, in cooperation with Ducks Unlimited Canada and the B.C. Wildlife Branch. Dabbling duck populations (approx. 100 000 birds) appear to be at or below numbers recorded within the last 20 years.

The proposed Pacific Habitat Joint Venture moved from the concept stage, to initial development of a prospectus. Discussions were held with various of the organizations likely to become partners in the joint venture, including the U.S. Fish and Wildlife Service, the B.C. Wildlife Branch, Ducks Unlimited Canada and The Nature Trust of B.C. A joint list of critical coastal habitats in B.C., Washington, Oregon, and Northern California was developed as the basis for joint venture action on the coast.

Waterfowl Studies - Northern B.C.

Waterfowl studies commenced in northern B.C. with spring staging surveys in the Teslin River basin. Ducks Unlimited assisted with staging surveys and provided funding for breeding pair surveys. Breeding pair surveys were conducted in two study areas within the boreal forest of northern B.C., the Liard Plain and the Teslin River basin. Wetlands within these two areas were stratified by size, and a sample surveyed within each strata. Preliminary analysis indicates that wetlands in the Teslin River basin were more productive than the Liard Plain wetlands. Detailed biophysical information also was recorded for each wetland surveyed. No previous pair surveys had been conducted in these areas, in part because of the expense of accessing the areas.

Brood counts were carried out along the north end of the Stewart Cassiar Highway and on a high elevation plateau southeast of the Teslin River basin. The high elevation wetlands were quite productive for dabblers and divers. Moulting Canada Geese were also found. Future pair surveys will include these inter-mountain plateaus of northern B.C.

Yukon Migratory Bird Studies

Waterfowl populations that use several important spring staging areas near Whitehorse were censused once again in 1989 as part of a long-term monitoring program. These high profile areas are key habitat for waterfowl and are also some of the most threatened wetland habitats in the Yukon.

Approximately 430 ducks were banded near Whitehorse in a continuing effort to determine the relationships between breeding, migration, and wintering areas for various Yukon waterfowl. This also helps meet the recently suggested objectives for duck banding in the Pacific Flyway.

Once again in 1990 CWS personnel coordinated and participated in the Yukon portion of the North American Breeding Bird Survey. The number of active routes was maintained at about 10, and efforts continue to recruit additional observers and obtain more coverage.

Work continued on the development of a Yukon Bird Data Base, which will eventually serve as the basis for a book on the status and distribution of Yukon birds.

CWS continued to play an active role in the cooperative Yukon Waterfowl Technical Committee, which is currently completing the Yukon Waterfowl Management Plan.

In the Inuvialuit Settlement Region, Pacific and Yukon personnel are completing a study of use of the Yukon coastal plain by snow geese during the fall migration. Part of this is a cooperative effort with the Yukon Department of Renewable Resources to produce a Landsat-based vegetation map that can be used to further understanding and protection of habitat for migratory birds and other wildlife in that important area.

Brant and Snow Geese

CWS began project to identify the major spring staging areas used by Brant passing through the Strait of Georgia. Preliminary observations of colour-marked Brant indicated that the Strait of Georgia is a much more important staging area then previously thought, as measured by the turnover rate of marked birds. The project will monitor turnover rates, allow the identification of critical habitats, and measure changes in body condition as Brant accumulate reserves while staging. This project will be integrated with other international projects designed to ensure the conservation of the Pacific Brant and with the developing Pacific Joint Venture.

Phase III of the agreement between Canada and the U.S.S.R. to exchange information on the Wrangel Island snow goose population was completed. Three Canadians, including one biologist from this region spent most of June on the Wrangel Island snow goose colony. Observations of birds banded on Wrangel Island and on the Fraser River delta were made and discussions towards a bilateral management plan for that population were held. Cooperation on the international snow goose banding programs continued when the snow geese returned to their winter quarters in The Fraser Delta. A pilot project was undertaken on the Alaksen National Wildlife Area to begin to determine the impact of snow geese grazing on upland field.

Status of the Harlequin Duck and Other Waterfowl Studies in B.C.

CWS staff completed a status report on Harlequin Duck in British Columbia as well as a report summarizing eight years of surveys on the waterfowl of the aspen parkland of British Columbia. They finished up studies of Barrow's Goldeneye by monitoring nest boxes used for the seventh year and by estimating adult survival and produced a report that summarizes five years of data on duckling mortality in Barrow's Goldeneye and Bufflehead.

Great Blue Heron Population Studies

The purpose of this study is to examine how herons select breeding and winter sites and examine factors that limit and regulate the populations. Great Blue Herons are of particular interest to CWS because they have been used to track contaminants in aquatic environments for over a decade.

Most colonies are found in trees near beaches and estuaries. Females catch small fish within a few kilometers of colonies, whereas males forage as far away as 27 km, mostly at night. In winter, most females and young-of-the-year leave the summer feeding sites for estuarine marshes and other beaches. Males defend territories along river banks. This segregation suggests that contaminant levels analyzed in eggs describe only habitats used by females. It also shows a clear need to protect a variety of sites, not just ones with large numbers of herons. The study will assess the magnitude of natural mortality and human-related threats on their long-term survival.

High Seas Drift-net Fishery

CWS joined with the Pacific Biological Station (DFO) in a cooperative study of the biological significance of the incidental bird kill in the high-seas drift-net fishery for squid. A CWS biologist joined the research team on a three-week cruise across the North Central Pacific Ocean during an experimental fishery was being conducted. Surprisingly, no birds were trapped in the nets but the cruise was an excellent opportunity to survey seabirds in a poorly known areas and the DFO experiments allowed the observations to coincide with the collection of detailed oceanographic data. Records kept by DFO observers on Japanese vessels indicate that the incidental kill in the commercial fishery was very much larger than in the experimental one and a repeat of the survey is planned for 1990.

Marbled Murrelets

CWS staff did preliminary studies of Marbled Murrelet activity over stands of coastal old growth forest and surveyed Murrelet concentrations in coastal inlets. There was much more activity over stands of old growth compared to various forms of second growth and those studies have led to more intense efforts to identify specific nesting habitats by radiotelemetry. The surveys in inlets located several intensively used sites and we now feel that much of the mullet population is concentrated within six large areas along the coast. In 1990, biologists will examine several of those areas in an effort to identify the characteristics of the habitat that makes them attractive to Murrelets.

Marine Birds

A symposium, sponsored by the CWS, the B.C. Fish and Wildlife Branch, and the Royal B.C. Museum, was held at the museum in Victoria, B.C., on February 22 and 23, 1990. The symposium topic was the *Status, ecology and conservation of seabirds in the temperate North Pacific* and consisted of three parts: 1) the status and ecology of nesting and visiting seabirds, 2) the distribution of birds at sea as determined by physical and biological processes, and 3) the history, conservation and management of seabirds. The symposium proved to be a success and the proceedings will be published by the Canadian Wildlife Service in Special Publications Series in the 1991-92 fiscal year.

We are compiling an Atlas on the distribution of pelagic birds off Canada's west coast that is to be published in the 1990-91 fiscal year. The atlas is based on the collection of survey data on seaboard distribution over the past nine years, on 20 000 km of sea transects conducted over that period off British Columbia. The atlas constitutes the first effort of the CWS to bring together all data on the distribution of pelagic bird species off Canada's west coast. The atlas will compliment an existing Atlas on distribution of inshore seabirds along Canada's west coast, published in 1983.

Nestucca Oil Spill Studies

Oil from the barge "Nestucca," damaged off the Washington coast in late December 1988, fouled the west coast of Vancouver Island in January and February 1989. CWS assessed waterbird mortality and the distribution and abundance of oil on breeding sites and wintering and migration areas at that time. Common Murres and Cassin's Auklets suffered the greatest mortality.

We designed follow-up studies to evaluate potential impacts on migrating and breeding populations. Concerns for migrating populations focused on Barkley and southern Clayoquot sounds, which attract large numbers of birds, especially scoters, gulls and shorebirds, and suffered extensive oiling during the spill. Aerial, boat and beach surveys were conducted during March, April and May. Foraging behavior of migrating Brant was investigated at Stubbs Island.

Breeding population studies were conducted in the Scott Islands, which support the majority of Common Murres and Cassin's Auklets nesting in the province. Pelagic Cormorant and Glacuous-winged Gull colonies along the west coast of Vancouver Island were also censused.

Results of those studies revealed no changes in migrating or breeding populations attributable to the oil spill. Numbers of Surf Scoters and gulls aggregating at herring spawning sites in Barkley Sound were comparable to those recorded on previous surveys, though their distribution was different, paralleling changes in the distribution of herring spawn. Traditional Brant foraging areas on Stubbs Island remained free of oil, and foraging behaviour did not appear affected by oiling of adjacent eelgrass beds. Herring did not spawn on Stubbs Island in 1989, and the quality of food may have been reduced. Breeding populations in the Scott Islands were similar to, or larger than, those reported in the past. Numbers of Pelagic Cormorants and Glaucous-winged Gulls nesting along the west coast were reduced, but causes are unknown.

Old Growth Forest Birds

A study was initiated in cooperation with the B.C. Ministry of Forests on biotic diversity in old growth and second growth forests. The relative abundance and diversity of birds, small mammals, and amphibians were determined in three forest types: old growth forest (200 years old), second growth forests (40-80 years old) and clearcuts (years old). Two geographical areas were compared, The Queen Charlotte Islands and the South Mainland Coast. Preliminary results indicate differences in the structure of wildlife communities in these forest types and great variability within forest types. The study will continue in 1990 and 1991. The researchers quantified activity patterns of Marbled Murrelet in old growth and second growth forests of the Queen Charlotte Islands. Preliminary results indicate a positive association between Marbled Murrelet activity and old growth forests.

Birds of British Columbia

The most recent comprehensive treatment of the bird fauna of B.C. was in 1947 when the British Columbia Provincial Museum issued a Review of the Bird Fauna of British Columbia, by J.A. Munro and Ian McTaggart-Cowan. Since that time, there have been many studies on the birds of the province and their habitat, which have yielded new information on the distribution and natural history of many species. In addition, over the past 40 years industrial and agricultural practices and urbanization which have affected the birds, their habitat and their distribution within the province. The Royal British Columbia Museum, B.C. Wildlife Branch, and CWS have been working cooperatively to bring together all existing information, on the birds of B.C., to review and synthesize that information, and to complete species accounts and distribution maps on the 400-plus species of birds known to occur or to have occurred in the province.

In 1989 volumes 1 and 2 on non passerines were sent to the printer for release in spring 1990. With assistance of a grant from Employment and Immigration Canada, data for volume 3 on passerines was computerized. Work on volume 3 will continue in 1990-91.

Communications

This year, CWS participated in a number of communication activities. On April 23, Pamela Whitehead and Dave Smith were invited to set up a booth for the opening of Pacific Spirit Regional Park. Our theme was the Great Blue Heron and our work on the large heron colony in the park. We gave demonstrations of how the mirrors located on selected nests in that colony are used with scopes to view inside the nests.

On June 4, we participated in the Fraser River Festival which had over 9000 visitors, and in early August we again set up an information booth for the Stanley Park Zoological Society where there was much interest from the public in our Who's Who pamphlets.

For the two-day "Celebration of Nature" festival held at Campbell Valley Park we had a theme of "backyard nature", with a display of bird feeders and nest boxes. Our Who's Who pamphlets on these subjects were popular.

The year's Snow Goose Festival was held at Alaksen in November, with a record Sunday attendance of over 6000 people. The geese cooperated by staying in Field 6 for easy public viewing and the display in Barn 1 showing CWS activity in the region was popular.

This year Pacific and Yukon Region has produced 19 of the approximate 39 technical reports published. Starting with report 86 all the technical reports produced in this region will be on recycled paper.

Electronic Data Processing

Major changes were implemented this year. Following the thrust of the department for office automation, a Microvax II computer was installed. This allows electronic communication with other Environment Canada offices across the country and will greatly assist in the movement and preparation of all types of documents. The second major change was the continued conversion of our scientific staff from an aging IMS 8000 to desktop IBM compatible computers and updated software.

The new technology has greatly expanded the capability and reduced the turnaround time for the scientific staff to analyze data and produce reports and displays. This process will continue during the next fiscal year and the desktop computers will be linked together so that they will be able to function more effectively as a system and to draw on the best of both the minicomputer and microcomputer worlds.

National Program 1.2
Wildlife Habitat

Habitat Management and Assessment

Habitat protection activities in B.C. concentrated on influencing land-use policies and programs of federal and provincial agencies on the habitat requirements of migratory birds was provided in several joint federal-provincial land-use planning schemes, including the Fraser, the Squamish and the Cowichan River estuary management plans, and by responding to more than 200 interagency land-use referrals. Active participation in Environment Canada Regional Screening Coordination Committee RSCC task forces providing input to EARP panel projects was also continued.

We continued monitoring habitat rehabilitation projects at the Campbell, Cowichan, and Englishman river estuaries. Habitat management was promoted by ongoing operations of migratory bird sanctuaries and national wildlife areas, by reviewing and revising management plans for these protected areas and by participating in the federal-provincial Pacific Estuary Conservation Program.

Habitat and Ecological Assessment

CWS sought to protect wildlife habitat in British Columbia by influencing land-use policies and programs of federal and provincial agencies and development plans of commercial interests by providing advice on the habitat requirements of migratory birds, on the potential development on habitat, and on ways to mitigate that impact.

Staff participated in several joint federal-provincial programs of environmental management, including the Fraser River Estuary Management Program (FREMP) and the Squamish Estaury Management Plan, and in environmental reviews, including the Fraser River Dyking Program and the Vancouver Island Natural Gas Pipeline. Major development proposals reviewed pursuant to EARP included the Jet Fuel Barge Terminal on Sea Island, initial plans for the parallel runway at Vancouver International Airport and several large marina proposals by the Small Craft Harbors Branch of the Department of Fisheries and Oceans on Vancouver Island. More than 350 land-use referrals were reviewed with respect to their impact on migratory bird habitat within the intergovernmental referral process.

As a result of the court decision on the Rafferty-Alameda Dam several projects in B.C., including the Newhawk mine and new pulp mills on the Nechako and Pine rivers as well as pulp mill expansions on the Fraser and Kootenay rivers, were also subject to federal reviews, in which we participated.

Preliminary to a potential basin-wide management plan, CWS explained its concerns about the impact of development on migratory bird habitat within the Fraser River water catchment area to members of the Conservative Party caucus as part of a joint Environment Canada-DFO multi-step briefing process.

Snow Goose Winter Ecology

This study involves research on the winter ecology of Lesser Snow Geese on the Fraser (B.C.) and Skagit (Washington) deltas, and aspects of their spring staging ecology between the Fraser Delta and Cooke Inlet (Alaska). The winter work involves an assessment of population abundance and distribution through air photo counts, movements and habitat use through radiotelemetry, and interaction with their traditional winter food (bulrush) through destructive sampling and the use of enclosures. The spring staging work will involve an assessment of movements and habitat use through radiotelemetry and interaction of captive geese with an important spring food (sedge), and through plant proximate analysis.

Wetlands

Contractors completed field checking and evaluating the wetlands of the Fraser Lowlands that had previously been identified by air photo interpretation. In addition, the habitat inventory for FREMP is now being incorporated into the study although data for the north and middle arms are still missing. A draft wall map of wetlands in the Fraser Lowland and a preliminary report have been completed.

The regional continued to participate in "Wetlands are not Wastelands," a joint Environment Canada-Wildlife Habitat Canada project. The consultant's report "Application of Wetland Evaluation Methods to the Cowichan Estuary" was finalized and distributed.

Land-use Studies

Information about Land use and land-use change during 1981-87 in the Lower Fraser Valley was analyzed using the SPANS GIS. A draft fact sheet has been prepared, focusing on the implications of urbanization for wildlife habitat and for agricultural land.

The program is designed to identify, conserve, and enhance threatened habitats that are unique or indigenous to the South Okanagan. CWS is represented on the SOCAP (South Okanagan Critical Areas Program) Committee, which was established to provide project direction and continuity and to guide the development of an operational plan for the area. Regional participation also included the preparation of a preliminary report and accompanying maps of "Relatively undisturbed areas in the south Okanagan."

SOE Reporting

CWS is represented on the regional SOE coordinating committee. Information was supplied for, and drafts were reviewed of, the following reports: water chapter 1991 report; phase I and phase II reports of SOE in the Lower Fraser Basin.

Spans Geographic Information System

In summer 1989, CWS completed a series of reports assessing existing and potential conflicts between marine birds and aquaculture on the B.C. coast. This was done using a database developed and stored in the PC-based SPANS Geographic Information System (GIS). The database consists of digital maps of aquaculture site parameters obtained from the province and data on the distribution of marine birds obtained from CWS and other agency records.

Also, during the summer, the inventory of the wetlands of the Lower Fraser Valley was refined through field checking. These maps, which had already been digitized and stored in SPANS in 1988-89, were then edited to reflect these new changes. With the addition to SPANS of wetland information from other agencies expected in 1990-91, this inventory will be the most complete database of its kind available on the wetland resources of the Lower Fraser Valley. The completion of this database will coincide well with the current acquisition of new GIS systems by many municipalities, regional districts, and

Provincial Ministries.

Finally, the Lower Fraser Valley land-use database was obtained from the Environmental Information Systems Division computer in Ottawa in mid 1989-90. Since then SPANS was used to analyze the land-use change in the Vancouver-Chilliwack area between 1980-87 and to assess the impact of urbanization on agriculture and wildlife habitat. This information will be incorporated into a fact sheet to be published in 1990-91.

Environmental Emergencies

An early morning collision, in fog, between two vessels in Vancouver Harbour 23 February 1990, spilled an estimated 40 of marine diesel in harbour waters near the south shore. CWS personnel were on scene later that day as part of a multi-agency task force to deal with the situation. The Wildlife Rescue Association of B.C. (WRA), the SPCA, and the Stanley Park Zoo were immediately notified to begin preparations to receive oiled birds. Aerial and boat surveys done by CWS personnel estimated over 5000 birds at risk within the harbour and a possible 10 000 birds in the area. Large numbers of birds involved with this spill would quickly overwhelm existing facilities. A larger bird cleaning facility was deemed vital by the second day. CWS's stockpiled bird cleaning supplies and portable hot water heating systems were mobilized to a central location at the Pacific National Exhibition (PNE). the donated facilities at the PNE set up and staffed in the Agriculture Building. The SPCA and WRA Media attention allowed the public to assist by donating materials that were in short supply. Trained members of the Environmental Youth Core picked up oiled birds. The high survival rate of birds collected to date largely due to the great effort put out early in the spill by all agencies and volunteers.

Another environmental threat occurred in December 1989 south of Boundary Bay. An oil spill, from a ship moored at a loading dock at Cherry Point refinery, was reported near the Canada/US border and was drifting north with the tide and wind. CWS immediately arranged for a helicopter survey to ascertain the situation. An oil slick approximately six square nautical miles was located directly south of Boundary Bay. The threat to this area at this time of year for migratory birds was enormous. Between 50 000 and 100 000 waterfowl were at risk from this spill. Wildlife rehabilitation organizations were notified and again the Environmental Youth Core made personnel available to patrol the Boundary Bay foreshore. Subsequent surveillance by CWS personnel could locate no oil and no oiled birds were picked up. It is thought that strong tidal currents of the area moved the slick into Georgia Strait and weather conditions allowed it to dissipate.

National Program
1.4 International Water / Wildlife Resources

Yukon Caribou

CWS continued to focus on the range use of the Porcupine Caribou herd by initiating two small field programs to document activity budgets and food habits during fall migration and August dispersal. As well, most of the data collected over the last 10 years have been integrated into a computer simulation model of the

energy relations of the herd, a process that culminated in a presentation at the 4th North American Caribou Workshop in St. John's, Newfoundland.

CWS cooperated with other departments during a successful photocensus of the herd in July and through its involvement in the Porcupine Caribou Management Board and the Porcupine Caribou Technical Committee.

Panama Shorebird Studies

A contract was let to Francisco Delgado of Fundacon de Parques Nacionales y Medio Ambiente to carry out shorebird banding and habitat studies in Panama Bay. The project was compromised by the October coup attempt and December invasion of Panama. In spite of the coup and invasion, Delgado and his team of students were able to accomplish some preparatory work around Panama City which will be useful for a 1990-91 project. When military activity made shorebird work too dangerous, Delgado retreated to Parita Bay and banded approximately 2 000 shorebirds and made important observations on habitat use and behaviour.

Large numbers of shorebirds that breed and/or migrate through Canada winter in Panama Bay. A few species include Western Sandpiper, Least Sandpiper, Short-billed Dowitcher, Whimbrel, Willet, Marbled Godwit, Black-bellied Plover, Lesser Yellowlegs, and Greater Yellowlegs. Panama Bay is a site of hemispheric importance for shorebirds. Information is required to establish links between Canadian and Panamanian bird populations and habitats and to form the basis for habitat management planning. The project will produce a trained Panamanian shorebird biologist and a cadre of local assistants and volunteers for future work. Use of Panamanian biologists and study manager increases the scope of the study and substantially reduces costs.

National Program 3.3
Toxics

Toxic Chemicals

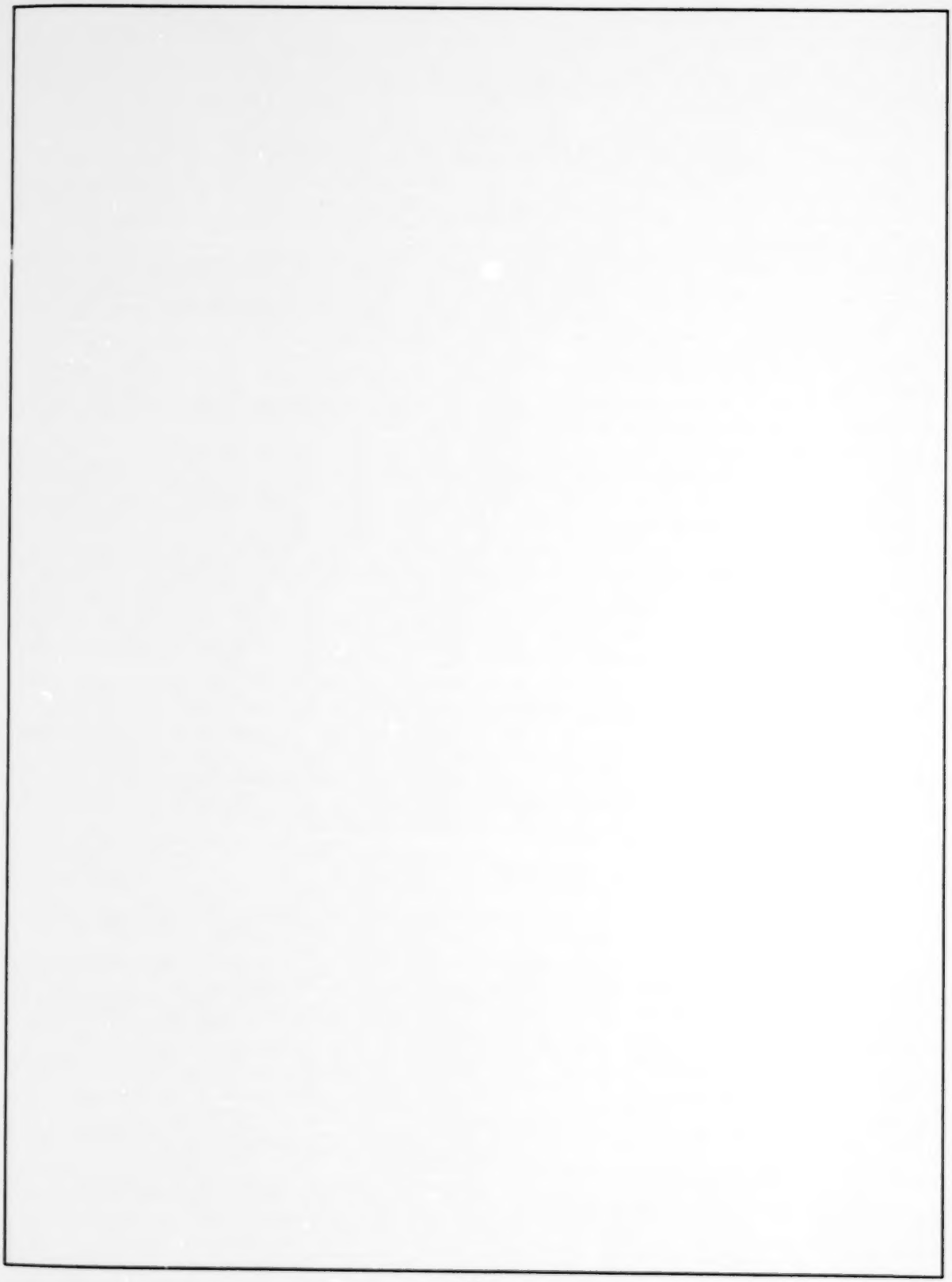
The dioxin issue continued to be the focus of toxic chemicals activities in the region again this year. Biologists collected Great Blue Heron and cormorant eggs from several colonies on the Strait of Georgia and analyzed them for dioxins and other chlorinated hydrocarbons. To date they have surveyed 14 heron and 9 cormorant colonies and found that every colony where the birds feed in the marine environment contained significant levels of dioxin contamination. Levels, particularly of 2378-TCDD, appear to be falling in the colony near Crofton, but increasing in the Fraser River estuary.

A paper on levels and effects of environmental contaminants in Great Blue Herons from B.C. was published in a scientific journal. A paper on dioxins and furans in fish-eating birds from the Strait of Georgia was presented at the international "Dioxin '89" conference. Two additional papers concerning the impact of dioxins on heron embryogenesis and hepatic enzyme induction have been submitted for publication by our cooperators at the University of British Columbia. We made several invited presentations concerning the levels and effects of dioxins and furans in wildlife were made to public, industry and government forums. A presentation about the possible impacts on wildlife of a third pulp mill on the Athabasca River was made before the Alberta-Pacific Environmental Impact Assessment Review Board.

Seabird contaminants monitoring continued with collection and organochlorine analysis of a variety of eggs from colonies in B.C. A paper on levels and trends of organochlorines in Pacific seabirds was published in a scientific journal. Two papers on contaminants in seabirds were presented at scientific conferences.

More than 300 waterfowl gizzards were collected and examined for the presence of lead shot to provide a data base with which to regulate the use of lead shot.

CWS was represented on the Regional Toxic Chemicals Advisory Committee which is responsible fo the coordination of regional interdepartmental and intergovernmental activities on toxic chemicals. Th committee prepared a five-year plan of action for toxic chemical studies for use by senior management.



Index of Wildlife References

A

alewife
- PCB research 3-20

Auklet, Cassin's
- oil spill mortality 9-78

B

bear, polar
- contaminants research 3-20
- habitat 1-3
- management 8-71

beaver
- trapping device 4-33

beetles, aquatic
- environmental effects on 3-17

birds, nongame
- banding 3-16

bison, wood
- recovery 8-69

bluebirds
- contaminant effects 7-59

Brant
- foraging 9-78
- spring staging 9-77

Bufflehead
- duckling mortality 9-77

C

caribou
- Porcupine herd habitat 1-3

caribou, Beverly-Kaminuriak
- commercial quotas 8-72

caribou, Peary
- ecological study 8-70

caribou, woodland
- habitat 8-69

Chickadees, Black-capped
- sublethal organophosphates effects 3-24

colonial birds
- nesting sites 6-48

Cormorant, Double-breasted
- dioxins 3-20

Cormorant, Double-crested

Pagination is by chapter and page number. Chapters are as follows:

1. Migratory Birds and Wildlife Conservation Branch
2. North American Waterfowl Management Plan Implementation Branch
3. Wildlife Toxicology and Surveys Branch, National Wildlife Research Centre
4. Program Analysis and Coordination
5. Atlantic Region
6. Québec Region
7. Ontario Region
8. Western and Northern Region
9. Pacific and Yukon Region

dioxins 3-19
egg monitoring 7-59
populations 6-46
Cormorant, Pelagic
populations 9-78
cormorants
deformities 3-22
environmental contaminants 9-83
population monitoring 7-59
crab
PCB research 3-20
Crane, Whooping
ecology 8-68
Cranes, Whooping
habitat use 8-68
Crow, American
breeding biology 8-65
Curlew, Long-billed
observations 8-72

D

deer, white-tailed
overpopulation 7-56
Doves, Ring
environmental effects on 3-17
Dowitcher, Short-billed
habitat management studies 9-83
Duck, Black
harvest strategy 5-35
hunting season 5-36
populations 5-35 - 5-36, 6-45, 7-53
Duck, Canvasback
survey 7-53
Duck, Common Goldeneye
acid-induced food web changes 7-58
Duck, Harlequin
harvest strategy 5-35
status report 5-38, 9-77
Duck, Hooded Merganser
food web changes 7-58
Duck, Pintail
populations 8-63
ducks
banding 7-53
habitat changes and populations 8-65
populations 8-63
ducks, dabbling
breeding success 8-65
ducks, sea
mussel loss 5-39

Pagination is by chapter and page number. Chapters are as follows:

1. Migratory Birds and Wildlife Conservation Branch
2. North American Waterfowl Management Plan Implementation Branch
3. Wildlife Toxicology and Surveys Branch, National Wildlife Research Centre
4. Program Analysis and Coordination
5. Atlantic Region
6. Québec Region
7. Ontario Region
8. Western and Northern Region
9. Pacific and Yukon Region

E

Eagle, Bald
- monitoring 7-57
- populations 3-21

Eider, Northern
- banding 5-36

eiders
- enhancement project 5-35
- habitat 5-37
- populations 6-46
- protection 6-44

F

Falcon, Peregrin
- nesting 5-38
- recovery 8-71

Falcon, Peregrine
- monitoring 7-57
- reintroduction 6-43, 6-48
- status reports 3-18
- survival plan 6-48

Flycatcher, Least
- habitat change 6-49

forest birds
- habitat 5-36
- landscape ecology 3-16

fox, arctic
- trapping systems 4-33

fox, swift
- recovery 8-71

G

gannets
- populations 6-46

geese
- hunting 6-44

geese, snow
- ecology 9-81
- GIS data 8-65
- populations 9-77

geese, white-fronted
- banding 8-67
- populations 8-66

Godwit, Marbled
- habitat management studies 9-83

Goldeneye, Barrow's
- duckling mortality 9-77

Goose, Brant
- survey 6-45

Pagination is by chapter and page number. Chapters are as follows:

1. Migratory Birds and Wildlife Conservation Branch
2. North American Waterfowl Management Plan Implementation Branch
3. Wildlife Toxicology and Surveys Branch, National Wildlife Research Centre
4. Program Analysis and Coordination
5. Atlantic Region
6. Québec Region
7. Ontario Region
8. Western and Northern Region
9. Pacific and Yukon Region

Goose, Canada 8-66
banding 5-36, 7-53, 8-67
damage permits 7-55
diet 6-46
removal 7-57
survey 6-45, 7-53
Goose, Greater Snow
population model 6-46
populations 6-45
Goose, Greater White-fronted
subsistance hunting 8-66
Goose, Lesser Snow
habitat 1-3
staging ecology 8-64
goose, snow
habitat 6-47
Gull, Glacuous-winged
populations 9-78
Gull, Herring
biomarkers 3-22
contaminant uptake modeling 3-20
dioxins 3-19
egg monitoring 7-59
PCB detection 3-18
PCB research 3-20
roof nesting 7-58
Gull, Ring-billed
contaminant analysis 3-19
control 7-58
damage permits 7-55
roof nesting 7-58
gulls
colonies 5-36

H

hemlock looper
spraying 5-40
Heron, Great Blue
dioxins 3-20
environmental contaminants 9-83
populations 9-77

K

Kestrel, American
PCB toxicity 3-22
kestrels
contaminant effects 7-59
Kittiwakes, Black-legged
populations 6-46

Pagination is by chapter and page number. Chapters are as follows:

1. Migratory Birds and Wildlife Conservation Branch
2. North American Waterfowl Management Plan Implementation Branch
3. Wildlife Toxicology and Surveys Branch, National Wildlife Research Centre
4. Program Analysis and Coordination
5. Atlantic Region
6. Québec Region
7. Ontario Region
8. Western and Northern Region
9. Pacific and Yukon Region

L

landbirds
- breeding phenology 8-65

larids
- populations 8-66

loons
- lake acidification effect model 3-17

Lyme disease 7-56

lynx
- leg hold traps 4-33

M

Mallard
- banding 8-65
- breeding biology 8-65
- population 7-53
- populations 8-63, 8-66

marten
- trapping systems 4-33

Merganser, Common
- contaminant analysis 3-19
- mercury contamination 3-17

Merganser, Red-breasted
- dioxins 3-19

Murre, Common
- populations 6-46

Murrelet, Ancient
- populations 3-15

Murrelet, Marbled
- activity patterns 9-79
- coastal old growth forest 9-78

murres
- harvest report 5-36
- MBC reclassification 5-35

Murres, Common
- oil spill mortality 9-78

Murres, Thick-billed
- diving behaviour 3-16
- studies 6-44

N

Night-Heron, Black-crowned
- egg monitoring 7-59

O

Osprey
- bioindicator 1-7, 6-50
- nests 7-57

Pagination is by chapter and page number. Chapters are as follows:

1. Migratory Birds and Wildlife Conservation Branch
2. North American Waterfowl Management Plan Implementation Branch
3. Wildlife Toxicology and Surveys Branch, National Wildlife Research Centre
4. Program Analysis and Coordination
5. Atlantic Region
6. Québec Region
7. Ontario Region
8. Western and Northern Region
9. Pacific and Yukon Region

Owl, Burrowing
- insecticide use 3-23

Owl, Great Horned
- PCB research 3-20

P

passerines
- banding 8-67

phalaropes
- surveys 5-36

Plover, Black-bellied
- habiat management studies 9-83

Plover, Piping
- habitat monitoring 5-38
- populations 8-70
- public education 6-43
- survival plan 6-48

puffins
- reintroduction 5-38

Q

Quail, Japenese
- PCB toxicity 3-22

R

racoon
- trapping systems 4-33

raptors
- organochlorine levels 3-22

Razorbill
- banding 6-46

S

salmon, chinook
- pulp mill effluent 3-20

salmon, coho
- PCB research 3-20

Sandpiper, Least
- habitat management studies 9-83

Sandpiper, Western
- habitat management studies 9-83

seabirds
- banding 3-15
- bycatch 5-36
- GIS data 8-65
- populations 6-44
- protection 6-44

seal, ringed

Pagination is by chapter and page number. Chapters are as follows:

1. Migratory Birds and Wildlife Conservation Branch
2. North American Waterfowl Management Plan Implementation Branch
3. Wildlife Toxicology and Surveys Branch, National Wildlife Research Centre
4. Program Analysis and Coordination
5. Atlantic Region
6. Québec Region
7. Ontario Region
8. Western and Northern Region
9. Pacific and Yukon Region

PCB research 3-20
shorebirds
banding 8-67
banding techniques 5-36
habitat management studies 9-83
research 3-15
staging area 8-67
Shrike, Loggerhead
survival plan 6-48
songbirds
banding 3-16
fenitrothion 3-23
Sparrow, Clay-coloured
breeding phenology 8-65
Swallow, Tree
breeding phenology 8-65
sublethal organophosphates effects 3-24
swallows
contaminant effects 7-59
Swans, Trumpeter
banding 8-69

T

Teal, Blue-winged
breeding biology 8-65
Tern, Caspian
banding 7-54
N.W.T. colony 8-66
Tern, Common 7-59
biology of 7-54
populations 6-46
Tern, Elegant
biology of 7-54
terns
colonies 5-36
Thrush, Swainson's 8-64
turtle, snapping
egg monitoring 7-59

V

Vireo Red-eyed
habitat change 6-49
Vireo, Warbling
breeding phenology 8-65

W

walrus
branding 8-72
Warbler, Black-throated Blue
habitat change 6-49

Pagination is by chapter and page number. Chapters are as follows:

1. Migratory Birds and Wildlife Conservation Branch
2. North American Waterfowl Management Plan Implementation Branch
3. Wildlife Toxicology and Surveys Branch, National Wildlife Research Centre
4. Program Analysis and Coordination
5. Atlantic Region
6. Québec Region
7. Ontario Region
8. Western and Northern Region
9. Pacific and Yukon Region

Warbler, Yellow
breeding phenology 8-65
waterfowl
boreal forest populations 8-66
breeding density 7-53
environmental emergencies 9-82
lake acidification effect model 3-17
management 9-76
organochlorines 5-40
studies 9-76
survey 7-53
Whimbrel
habitat management studies 9-83
Woodcock, American
populations 6-45
woodcocks
wing survey 5-36
Wren, House
breeding phenology 8-65

Y

Yellowlegs, Greater
habitat management studies 9-83
Yellowlegs, Lesser
habitat management studies 9-83

Pagination is by chapter and page number. Chapters are as follows:

1. Migratory Birds and Wildlife Conservation Branch
2. North American Waterfowl Management Plan Implementation Branch
3. Wildlife Toxicology and Surveys Branch, National Wildlife Research Centre
4. Program Analysis and Coordination
5. Atlantic Region
6. Québec Region
7. Ontario Region
8. Western and Northern Region
9. Pacific and Yukon Region